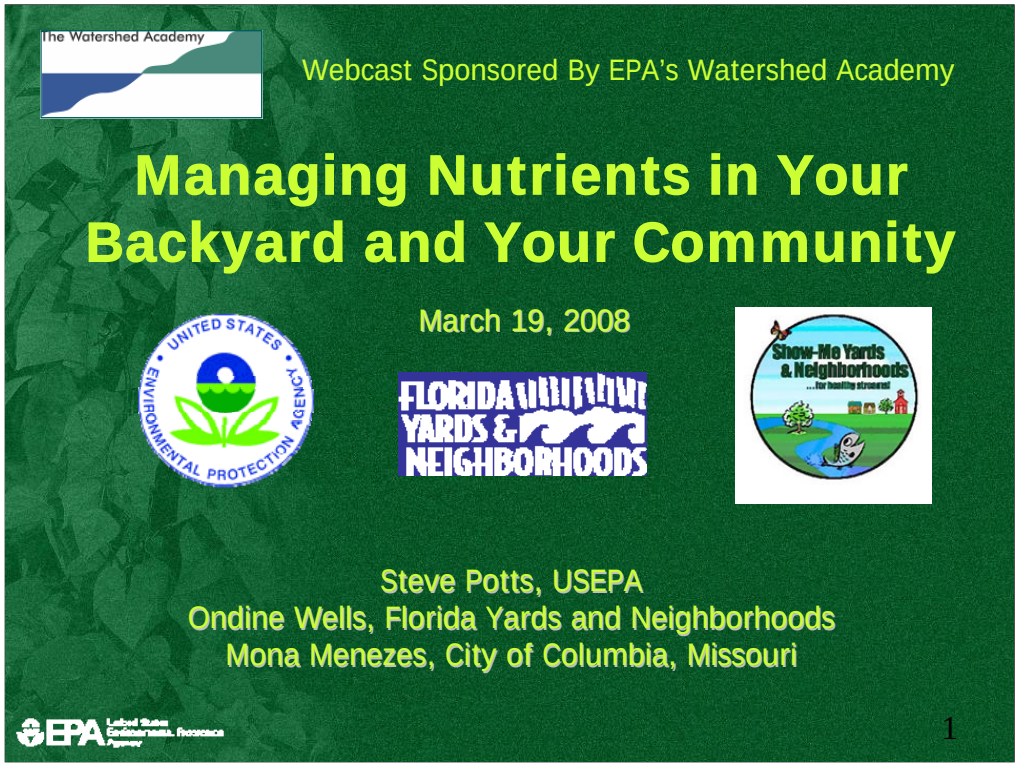

Nutrient Pollution in Your Watershed:

What It Is, and Steps To Reduce It

Presented by
Steve Potts,
U.S. EPA
Office of Water
Office of Science and Technology

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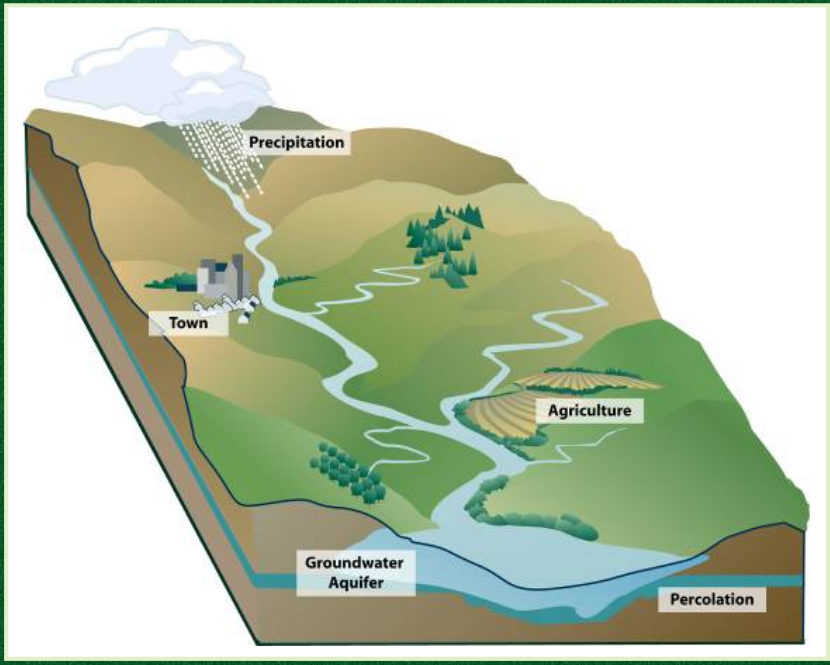
"Nutrient Pollution" also known as Nitrogen and Phosphorus Pollution

4

I'm here today to tell you about nutrient pollution, why you should be concerned about it, and what you can do to reduce nutrient pollution in your community. The term "nutrients" refers to nitrogen and phosphorus, which are the specific pollutants of concern that we'll be discussing today.

Watershed

- A watershed is an area of land where all of the water drains into a common body of water. Watersheds are also referred to as “drainage basins.”



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To understand nutrient pollution and how you can help reduce it, you first need to understand watersheds.

A watershed is an area of land that drains into a common body of water. Within a watershed, each small body of water will flow into another, larger body of water, creating one, inter-connected system. You may have heard of the Chesapeake Bay Watershed or the Mississippi River Watershed – both are examples of large watersheds within the United States. But watersheds can also be small. There is a watershed for the creek or stream in your neighborhood. You are always in a watershed!

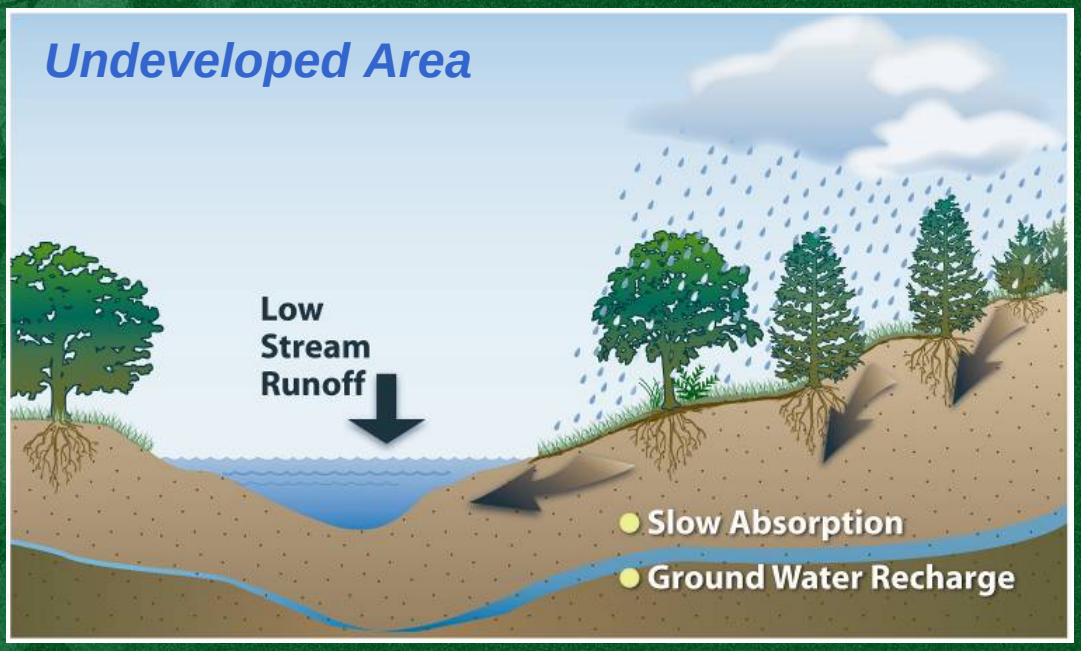
The path water takes as it flows downhill impacts water quality.

Water runs off the land, carrying fertilizer, dirt, pet waste and many other pollutants with it directly into the waterway.

6

When precipitation falls within a watershed, the water eventually enters a waterbody as stormwater runoff or through groundwater recharge. In this example of a developed area, the rainwater washes over paved surfaces and does not have an opportunity to percolate through the ground. Pollutants are carried in the runoff water into our streams, lakes, groundwater, estuaries and oceans. Dirt, bacteria, nutrients, metals and pesticides are just a few of the pollutants that make their way into waterbodies through stormwater runoff. The focus of this presentation will be the nutrient pollutants.

The path water takes as it flows downhill impacts water quality.

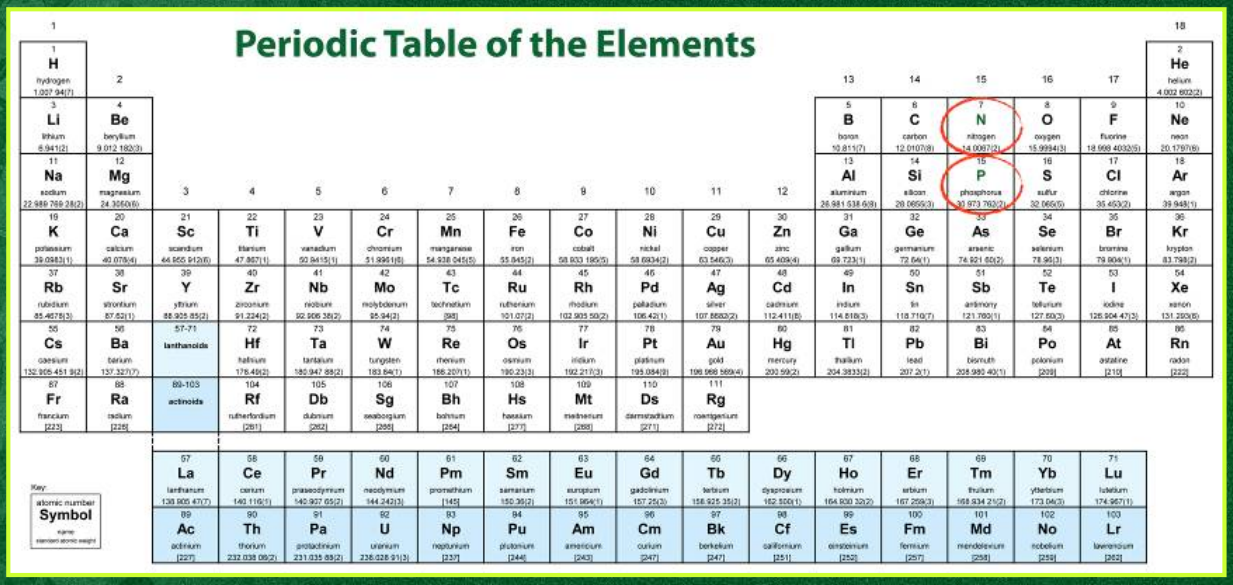


Water percolates through the ground slowly.

7

In this example of an undeveloped area, the ground is not paved so the runoff has an opportunity to flow over surfaces that allow the water to percolate into the soil. Plants and soil act as a natural filter by absorbing some of the water and nutrients as well as a physical means to slow the water's flow and allow it to saturate and percolate through the ground. From a water quality perspective, which is the preferred scenario of these two slides – the previous slide or this one? Answer – this slide.

Nitrogen and Phosphorus 101



Before we talk about the problems that nutrients cause, let's first talk about some of the science behind nutrients.

What are Nutrients?

- Nutrients are elements, like nitrogen and phosphorus, that occur naturally in water, soil, and air
- Sources of nutrients
  - Decaying plant matter
  - Animal and human wastes (pet waste, septic tanks, Waste Water Treatment Plants)
  - Detergents
  - Fertilizer (residential, commercial, and agricultural)

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Nutrients come from several different sources. For example, decaying plant matter, human and animal wastes are nutrient sources. Our ecosystems depend on nutrients to function properly, but too much nitrogen or phosphorus can cause problems in waterbodies.

Our common, everyday practices introduce larger quantities of nitrogen and phosphorus into the environment than would be naturally introduced. For example, some of the dish and laundry detergents we use everyday contain phosphate, a form of phosphorus. The fertilizers we use on our gardens and lawns are a significant source of the nutrients that enter our waterways and they are the focus of our discussion today.

Note to presenter: For detailed information on detergents and phosphate, see Advanced Slide 11.

Nitrogen

- Highly soluble in its common compound form, nitrate.
- Easily washed from the soil by rain or irrigation.
- Leached from the soil or absorbed by plants within weeks of application.
- Stimulates shoot growth in plants.
- Signs of deficiency can mimic other plant illnesses; yellowing leaves (with or without a reduction in size).

EPA

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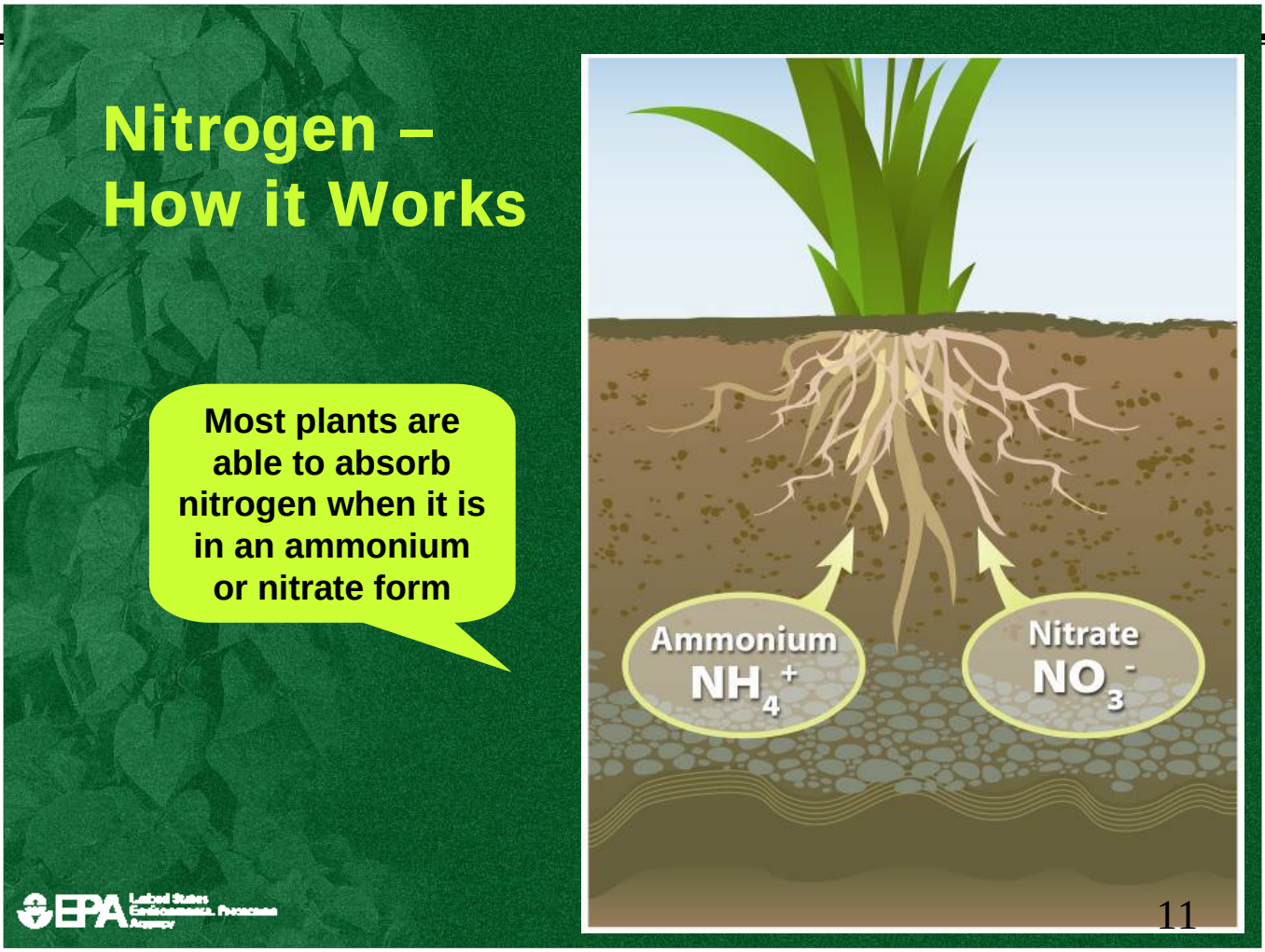
Nitrogen is very soluble. This property allows it to be absorbed by plants very quickly – within weeks of application. However, this property also makes it a threat to water quality because it can be washed out of soils easily by rain or irrigation water.

Fertilizers containing nitrogen promote shoot growth. Conversely, fertilizers that do not contain nitrogen promote the growth of flowers, fruits and roots.



ADVANCED SLIDE: For audiences requesting greater detail.

The element nitrogen (N) combines with other elements to form compounds. Some common nitrogen compounds that you may be familiar with include ammonium (NH_4^+),ammonia (NH_3), nitrite (NO_2^-) and nitrate(NO_3^-). In fact, 78% of our atmosphere is composed of the inert form of nitrogen (N_2).

Plants need nitrogen to grow, but they can not easily use every form of nitrogen listed above. In fact, 78% of our atmosphere is composed of the inert form of nitrogen (N_2) but plants are not able to directly access N_2 from the air. Plants are able to use the inorganic forms of nitrogen (nitrate, ammonium and ammonia). In the soil there are microorganisms (organisms that are visible with the use of a microscope) that convert nitrogen into forms that are useable by plants - ammonium (NH_4^+) and nitrate (NO_3^-).

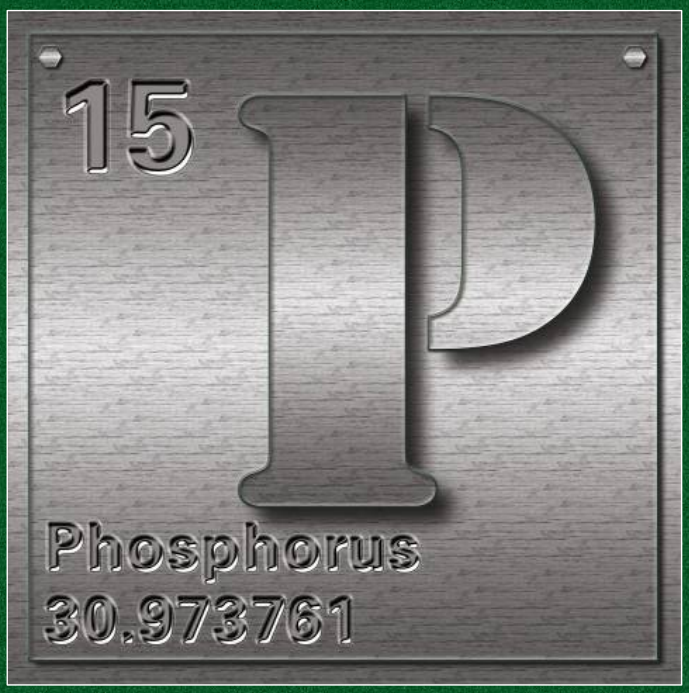
Nitrogen "moves" among its different forms through the nitrogen cycle. To learn more about the nitrogen cycle, visit http://en.wikipedia.org/wiki/Nitrogen_cycle to find a good description of the nitrogen cycle and an EPA-generated representation of the nitrogen cycle.

Nitrate is inorganic and is a commonly used form of nitrogen in fertilizers. Nitrate is very soluble in water and does not bind to soils. With excessive watering or runoff, nitrate is easily washed away from the plant and enters groundwater or surface water (rivers, lakes, streams). Ammonia, ammonium, nitrate and nitrite have the greatest impact on water quality because these forms are directly available (or are easily converted to a directly available form) for plant/algae use.

Total nitrogen, a summation of all of the forms of nitrogen (inorganic and organic), is often used for lakes and reservoirs.

Measurements of inorganic nitrogen forms (ammonia, ammonium, nitrite and nitrate) are often used to measure nitrogen levels in rivers and streams.

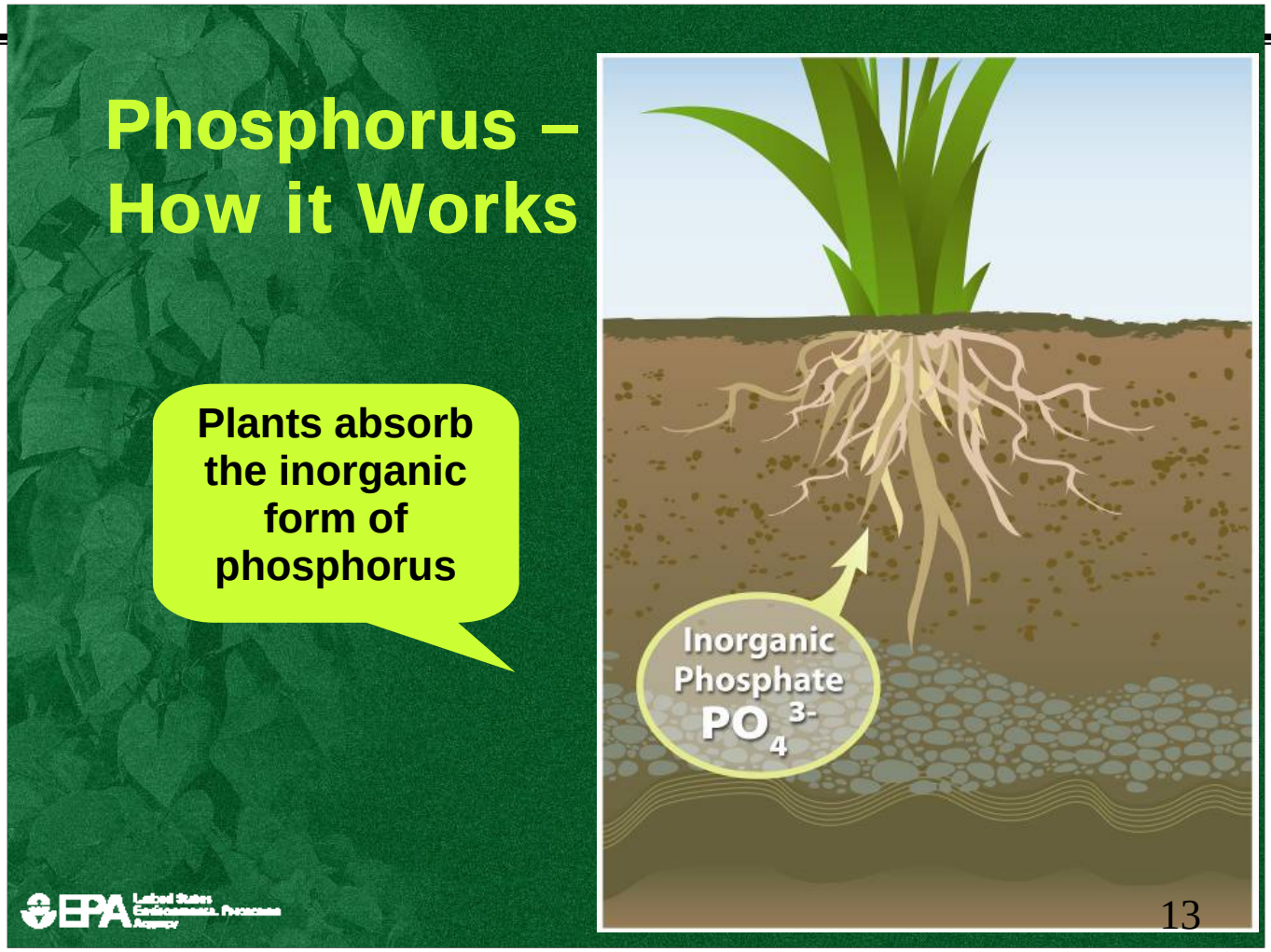
Phosphorus



- Typically found in soil as an insoluble compound.
- Leaches from the soil very slowly.
- Deficiency appears first as slowed growth. The leaves will become dull and dark green or grayish green.

In some plants, like corn and tomatoes, a hallmark of a phosphorus deficiency is magenta areas on the leaves.

In a natural freshwater environment, phosphorus is found in very small quantities. However in human-impacted aquatic environments, there are often larger quantities of the phosphorus compound, phosphate. Increased phosphate levels in aquatic environments are a threat to water quality because phosphate fuels the growth of algae and a phenomenon called “eutrophication” that we will discuss further in just a moment.



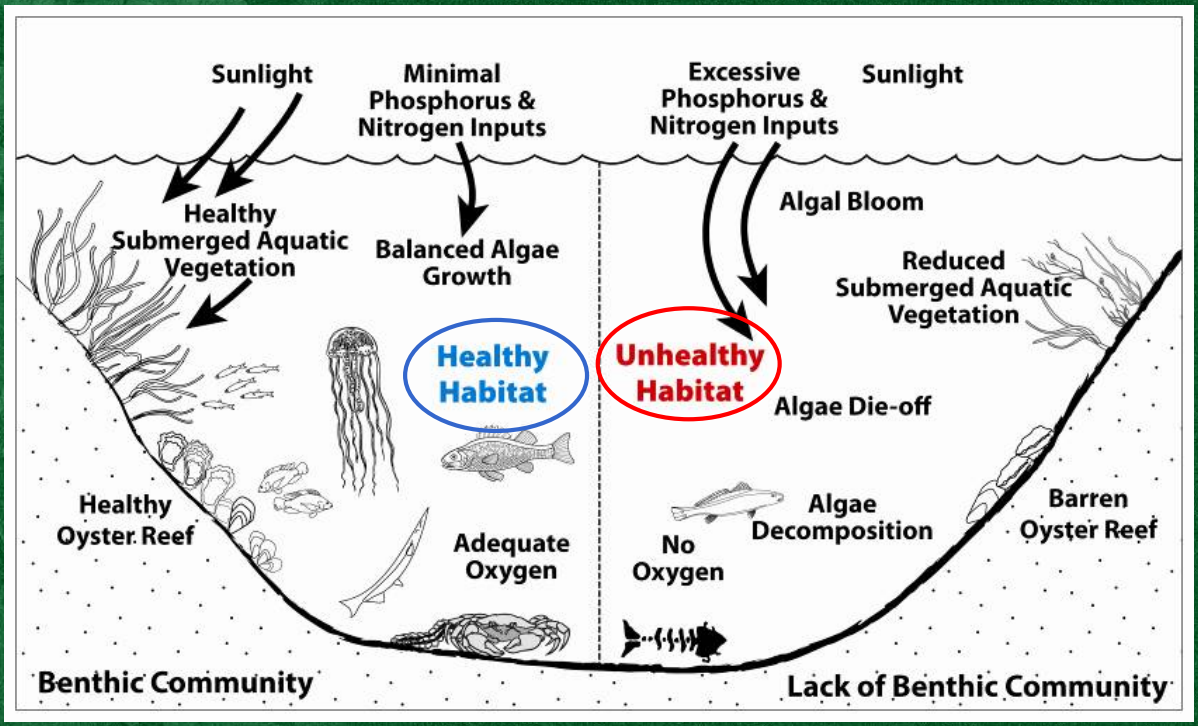
ADVANCED SLIDE: For audiences requesting greater detail.

Unlike nitrogen, phosphorus does not naturally exist as a gas in the atmosphere. Phosphorus can be found naturally in rocks and natural phosphate deposits. Natural processes like weathering and erosion release phosphorus into terrestrial environments. Phosphorus is always found in a compound state. In nature you would not find a P or a P_2 compound. Instead you would find phosphorus in its compound phosphate PO_4^{3-} or as phosphate bound with other elements.

Phosphorus is found in organic and inorganic forms and it is through the phosphorus cycle that it moves between these forms. In its organic form, phosphorus is bound to living or dead plant/animal tissue or is in the by-product of a biological process such as animal excretions. Organic phosphorus is not available to plants for use. Phosphorus is most stable in its inorganic form and it is in this form that it is usable by plants and algae. Inorganic phosphorus occurs as an orthophosphate (PO_4^{3-}) (often referred to as "phosphate") or a polyphosphate ($H_2PO_4^-$ or HPO_4^{2-}). Scientists refer to this form of phosphorus as SRP – "Soluble Reactive Phosphorus".

For rivers and streams, SRP is often used to measure the phosphorus level in the waterway because this is the form that encourages algae growth. Total phosphorus levels are commonly used to measure the phosphorus levels of lakes and reservoirs – a total of the inorganic and organic sources of phosphorus. Why do lakes and reservoirs use total phosphorus instead of SRP to measure phosphorus levels? In lakes and reservoirs, phosphorus will remain in that location for a longer period than it would in a flowing stream or river, thus providing an opportunity for the organic forms to move through the phosphorus cycle in a lake or reservoir and eventually be transformed into the inorganic form and utilized by the plants/algae.

Eutrophication: The process of excess nutrients (nitrogen and phosphorus) accelerating the growth of algae in a waterway, which often results in a decrease of oxygen in the waterbody.



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When too many nutrients enter a waterway, they fuel an "explosion" of phytoplankton – an occurrence that we refer to as an "algal bloom". The process itself is called eutrophication. Thick algae mats block sunlight from reaching other underwater plants, causing the plants to die. Algae themselves have very short life spans. After they and other plants die, they sink to the bottom of the waterway. Bacteria consume oxygen while breaking down the algae, using up the limited oxygen resources that are available.

As a result of the algal blooms, dissolved oxygen levels drop in the waterway and aquatic organisms like fish are unable to breathe. In some cases, the algal blooms produce toxins that make the water unsafe for human contact. While you may not see algal blooms in the stream or lake nearest your home, remember that downstream waters could be impacted as nutrient runoff increases and reaches unhealthy levels.

Nutrient Pollution Is a Serious Problem

- Waterbodies in almost every state and territory are impacted by nutrient pollution.
- States have identified over 10,000 waterbody segments impaired by nutrients.

http://www.epa.gov/waters/305b

Top 5 Causes of U.S. Waterbody Impairments
1. Mercury
2. Pathogens
3. Sediment
4. Metals
5. Nutrients

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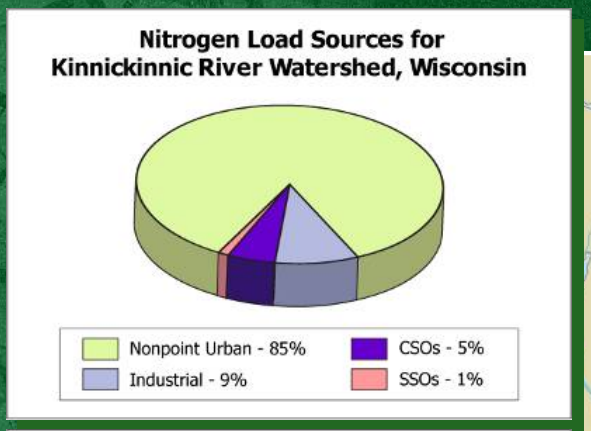
Many of our nation's waters, including streams, rivers, wetlands, estuaries and coastal waters, are affected by nitrogen and phosphorus pollution. Every two years states are required by Clean Water Act Section 303(d) to report which waterbodies within the state do not meet state-set water quality standards. You can view your state's most recent list of impaired waters at www.epa.gov/waters/305b.

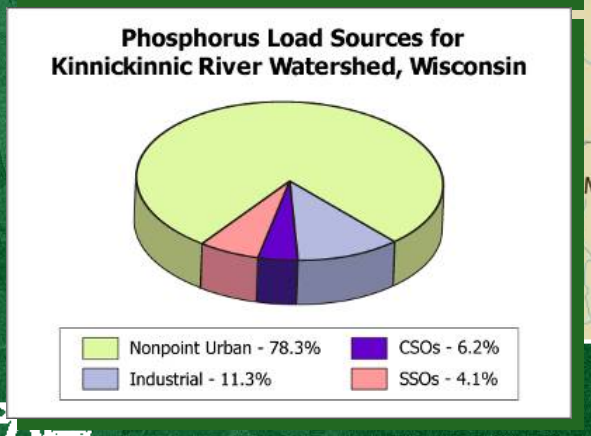
At www.epa.gov/waters/305b, click on your state in the interactive map. The next page will provide a synopsis of your state's waterbody health. Towards the top of this page, each state also has a link to the state-hosted water quality website.

I mentioned earlier that nutrients come from a variety of sources such as pet wastes, septic tanks and fertilizer. Let's look at data from specific regions of the country to see what sources of nutrients are plaguing certain watersheds. Although your region may not be represented in this presentation, these examples are somewhat representative of what is happening around the country. As we go through them, feel free to share your thoughts on other regions of the country where source contributions may be quite different.

Note to presenter: Try to find region-specific information for your area for comparison.

Kinnickinnic River, Wisconsin





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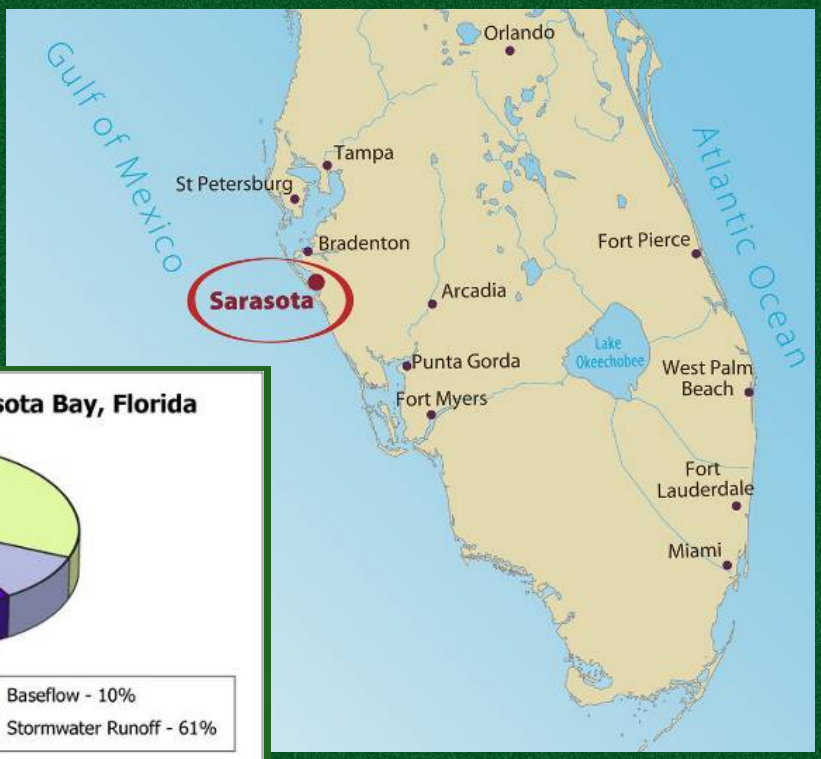
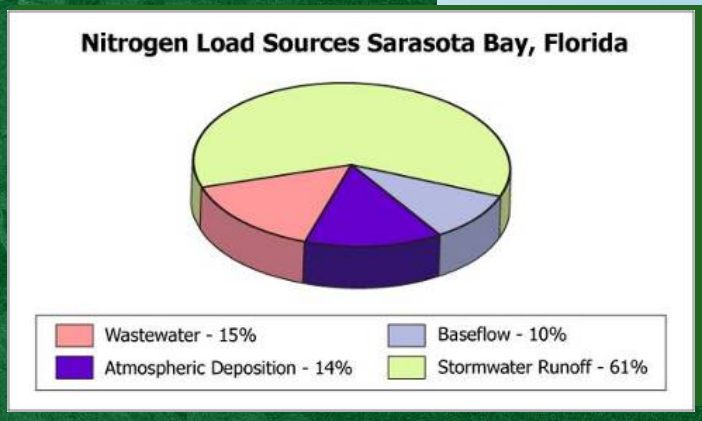
As we saw with the development of nutrient criteria, there is some variance across the country with the progress being made towards addressing our nutrient problems. Many localities have begun determining the sources of the nutrients that are entering their waterways – the first step in creating a plan to address the problem. Pictured above are pie charts depicting the total nitrogen and phosphorus loads in the Kinnickinnic River Watershed, located just south of Milwaukee in Wisconsin. Note that the majority of the nutrients entering this watershed come from "Nonpoint Urban Sources". Nonpoint urban sources include runoff from land uses such as residential, industrial, commercial, etc.

Sarasota, Florida





Note: Data taken from Sarasota Bay Estuary Program. "*State of the Bay 2006*"

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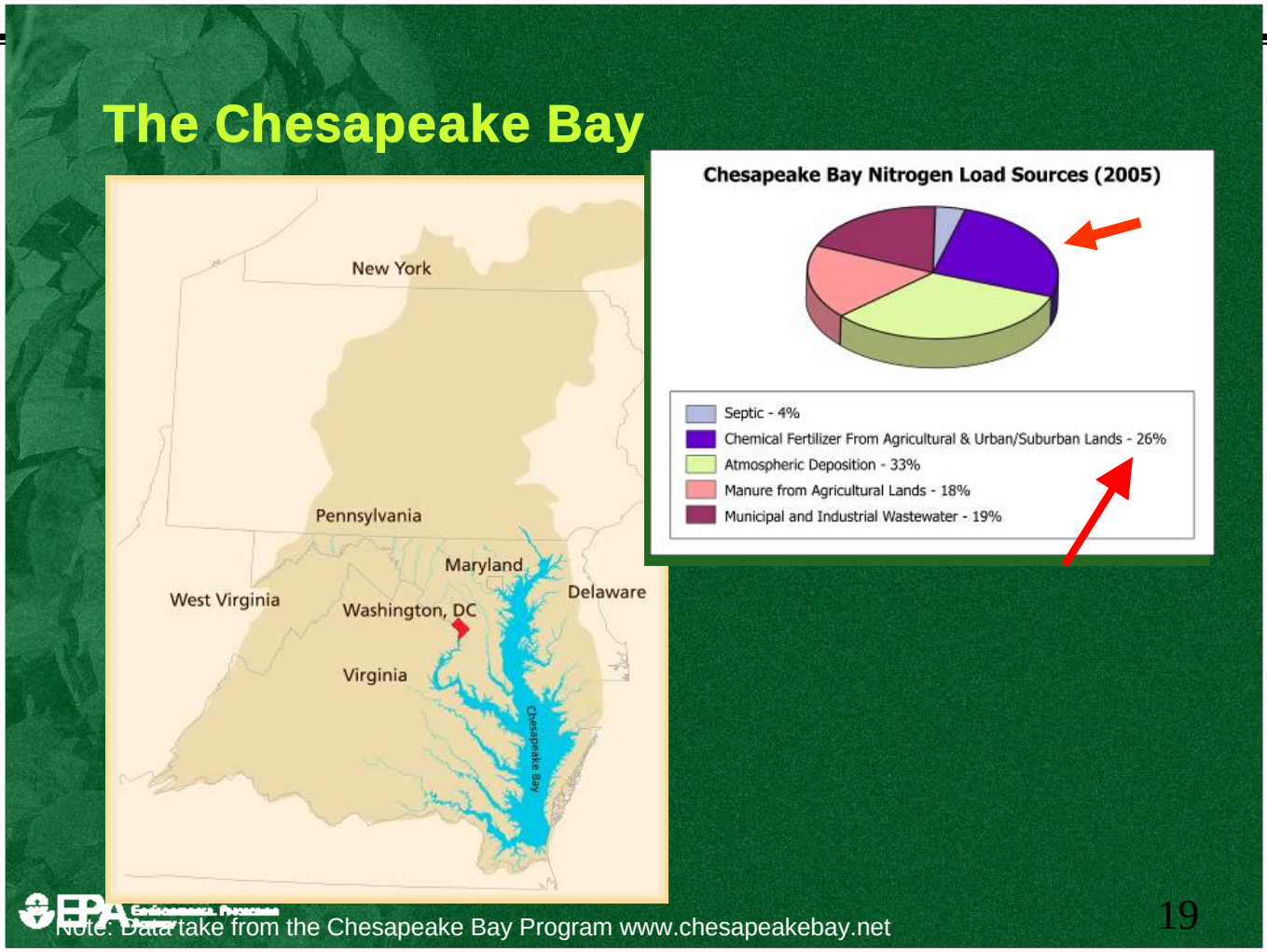
Sarasota, Fl is South of Tampa and North of Fort Myers on the Gulf of Mexico Coast. As with the Wisconsin example on the previous slide, you'll note that in the Sarasota Bay's Watershed, stormwater runoff is the primary source of nitrogen. For this locality's example, "stormwater runoff" refers to nitrogen sources including fertilizers, pet wastes and any other nitrogen sources that would be washed off of the ground and into stormdrains that lead to local waterbodies.



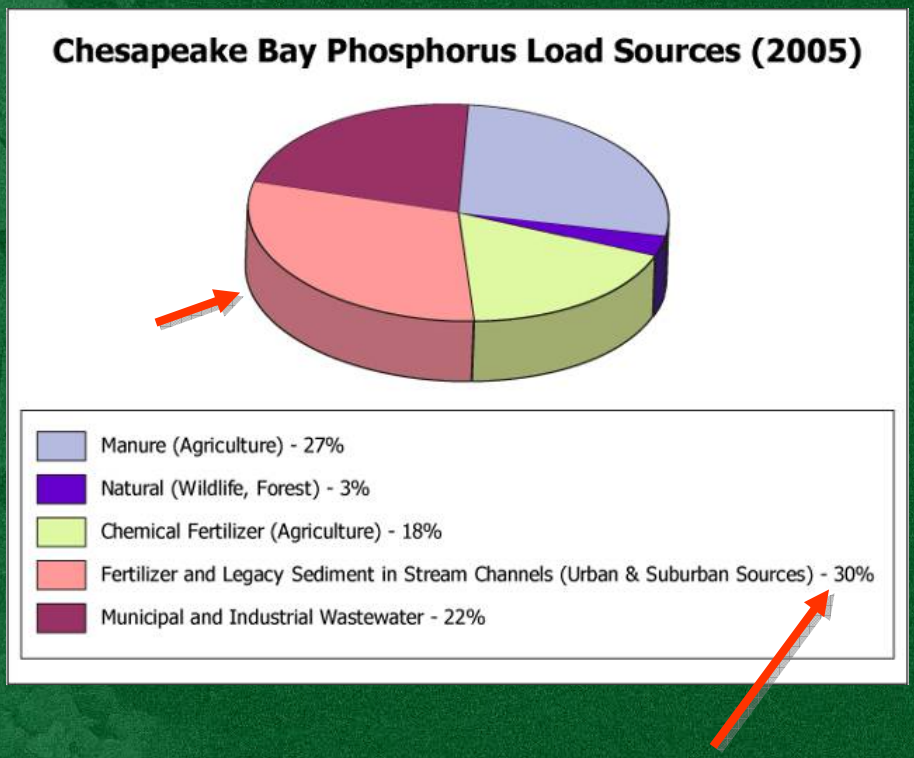
The restoration process for the Chesapeake Bay in the Mid-Atlantic portion of the country is one of the older, national-scale efforts to restore a watershed. Because of the federal, regional and local resources that have been appropriated to the Chesapeake Bay, the level of detailed data is greater and the identified nutrient sources impacting this watershed are more specific than in our Sarasota and Kinnickinnic examples. Ideally, this amount of data is what we would like to see for all localities. It not only helps identify the source of problems, but also helps states and EPA track improvements in water quality.

Where does the nitrogen come from that is captured in atmospheric deposition? Vehicles and other mobile sources, electric utilities, industry, livestock and fertilized soil.

What is of particular interest to us on this pie chart is the slice representing chemical fertilizer. Approximately 73 million pounds* or 26% of the total nitrogen load to the Bay in 2005 was due to fertilizer from agricultural and urban/suburban areas in the Bay watershed. Of this total, approximately 44 million pounds came from agricultural lands and 29 million pounds came from urban/suburban lands.

*Numbers were based on long-term average hydrology simulations.

Chesapeake Bay - Phosphorus



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Note here that again, urban and suburban sources of phosphorus are a significant portion of the pie chart. You might be wondering what is meant by the term “legacy sediment in stream channels.” When this particular watershed was originally settled in the 1700s and 1800s, large swaths of trees were cut down to make room for settlers. This deforestation and later land-clearing practices resulted in a significant amount of erosion. Today, sediment resulting from land disturbances in years past is still being flushed through the watershed and is making its way to the Bay. But what does sediment have to do with phosphorus?

Soil Erosion Also Carries Nutrients to Waterways

Erosion not only washes away valuable soil but carries pollutants, including phosphorus, into waterways.

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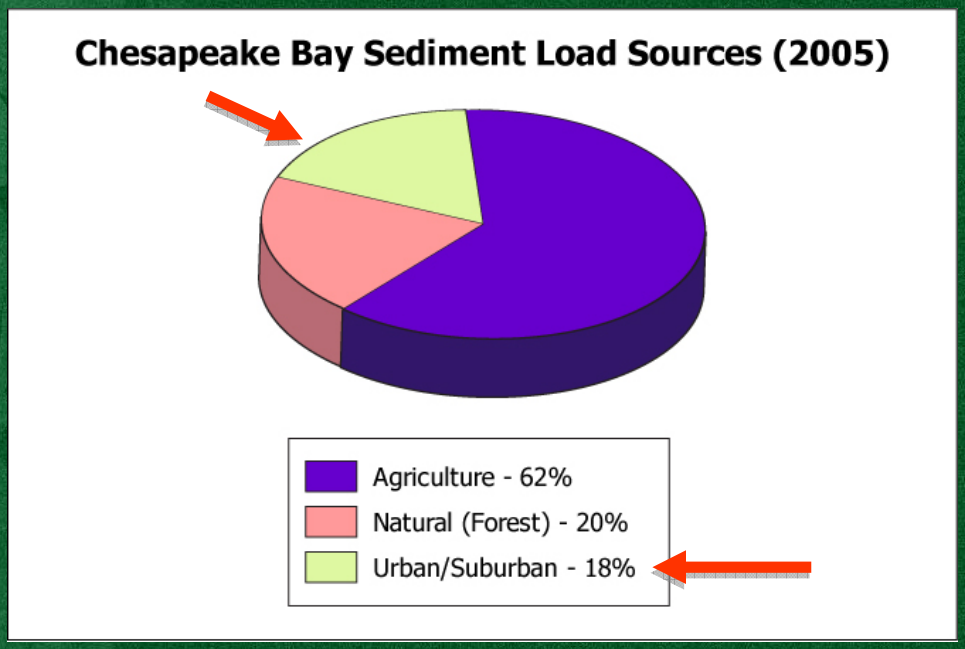
In addition to being washed directly from lawns and gardens, phosphorus is carried by sediment that is washed into our stormdrains and waterways. Earlier in the presentation, we discussed how phosphorus is not very soluble. In fact, it readily binds to soil. When sediment washes off of the land and into our waterways, it carries phosphorus with it.

By itself, sediment can smother bottom-dwelling plants and animals, such as macroinvertebrates, oysters and clams, and decrease the water's transparency, making the water cloudy so less light is available for underwater vegetation to grow and produce oxygen. Sediment carrying nutrients presents an even greater problem…

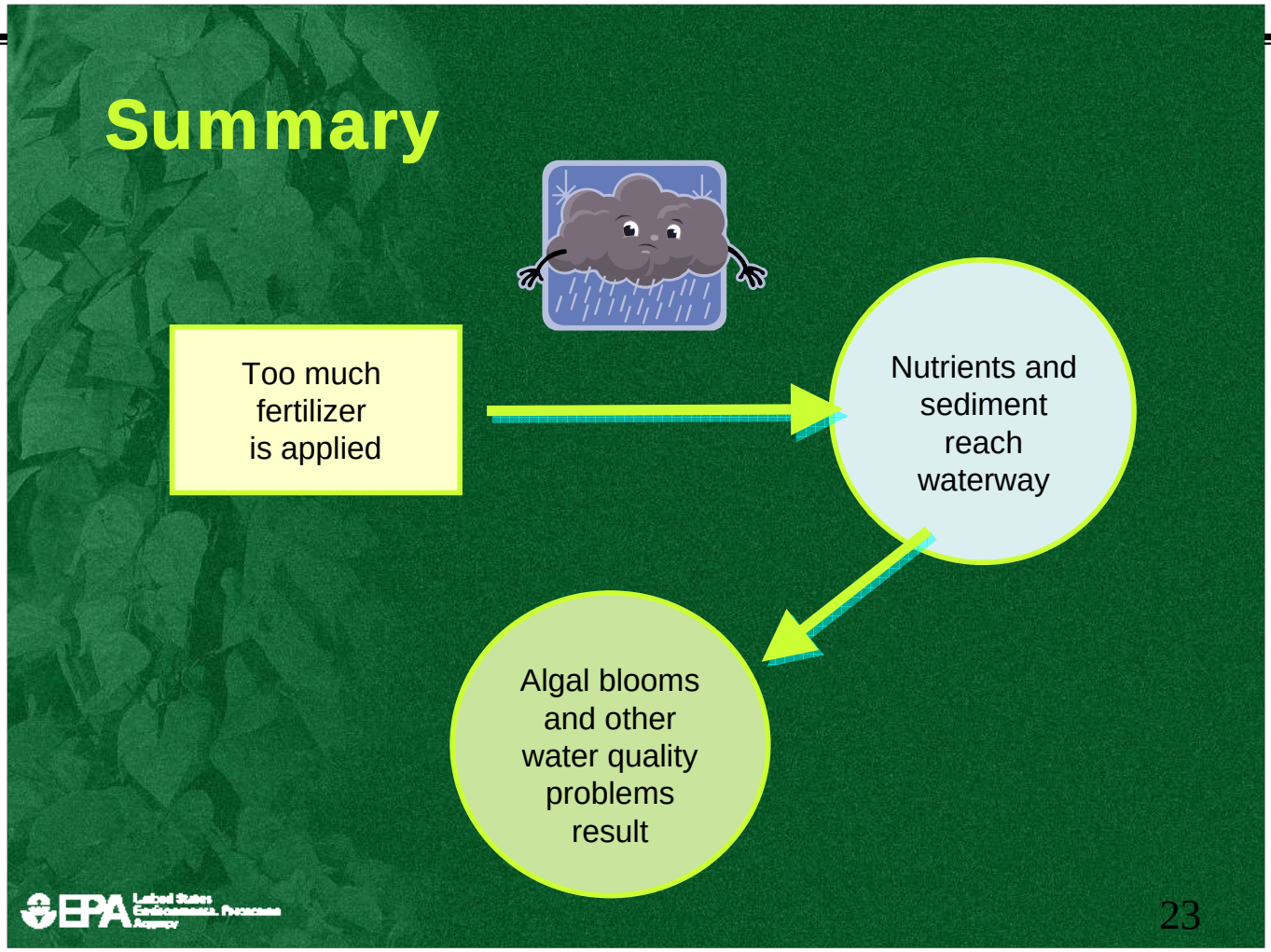
The Chesapeake Bay – Sediment



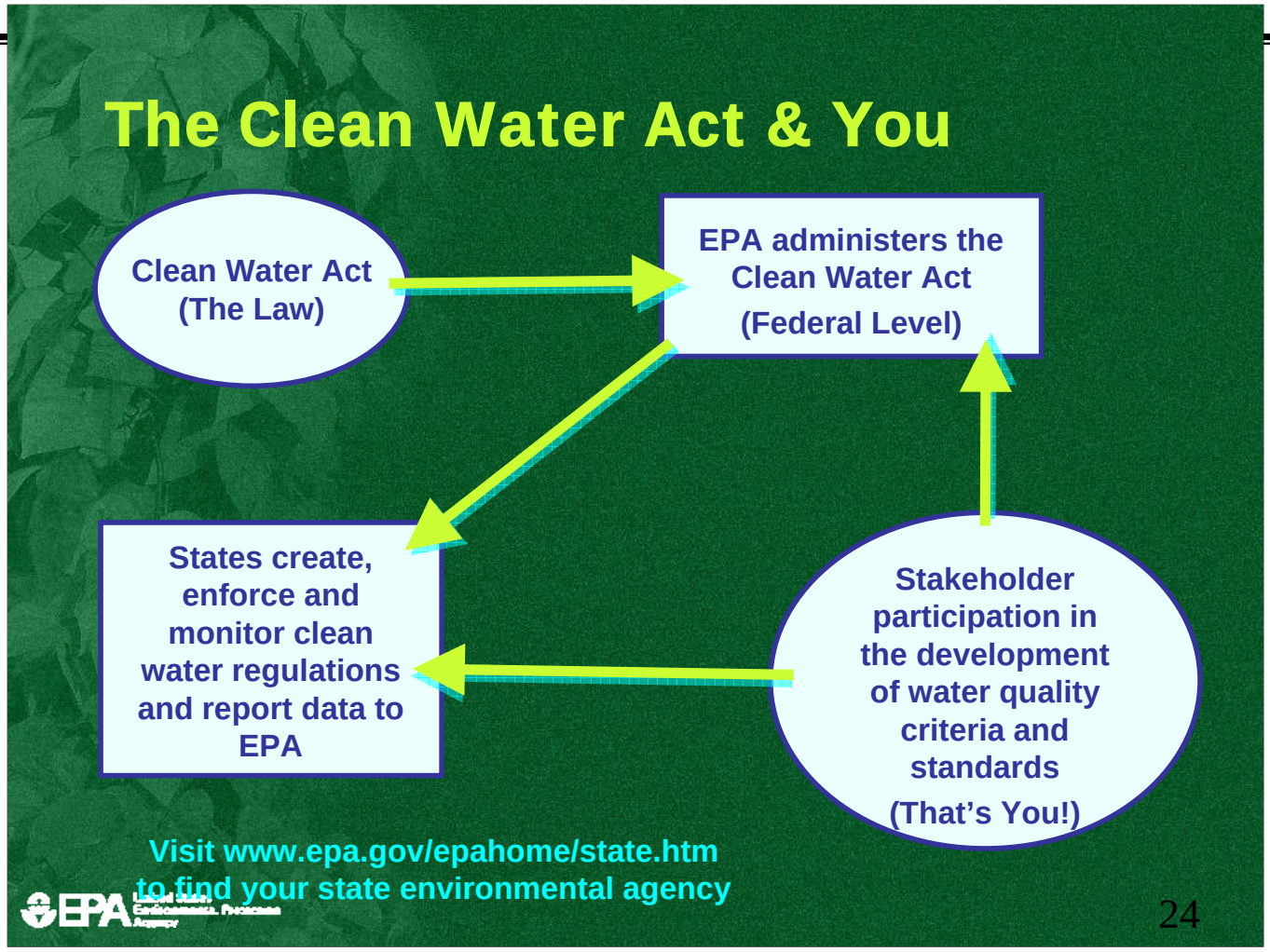
22

An estimated 18% of sediment loads entering the Bay comes from urban and suburban areas. Sediment erosion occurs in an urban/suburban setting when soil is exposed during a precipitation event or during times of high wind. The sediment is washed or blown down stormdrains or directly into a nearby waterway. Common areas where this occurs includes construction sites, eroded non-tidal streambanks and spots in lawns and landscapes that are not vegetated.

Remember! Erosion is a natural process, hence the portion of the pie chart that represents natural/forest sources. But when erosion takes place at an accelerated pace and from unnatural causes (which represents 80% of this chart), there is a negative impact on water quality.



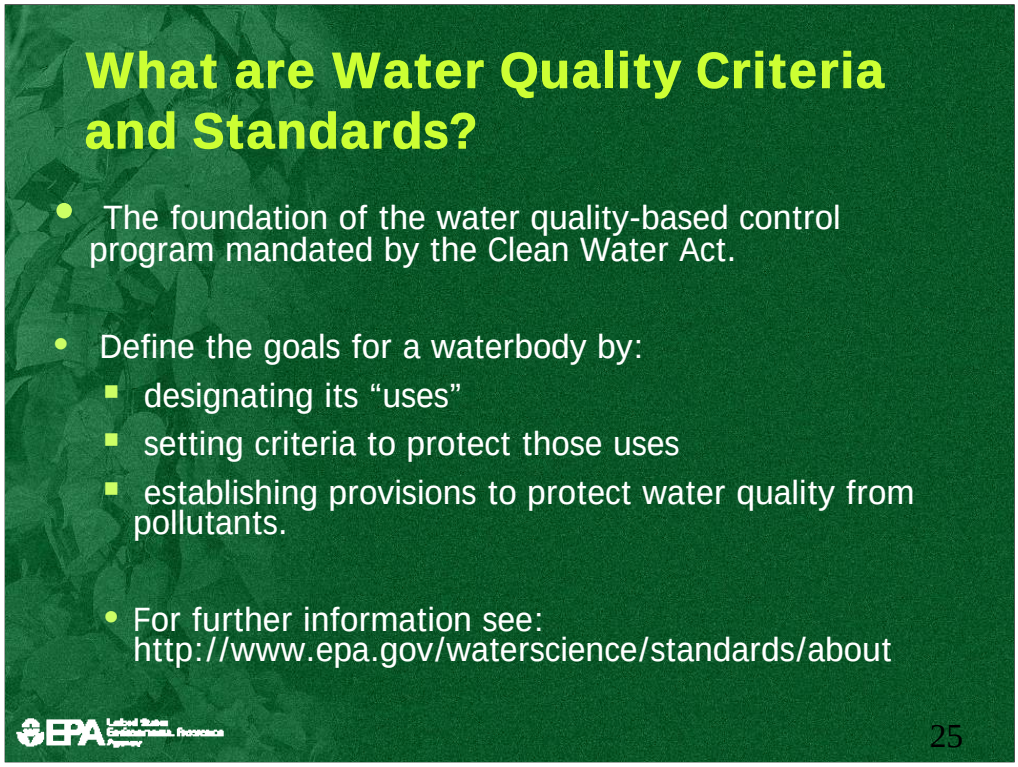
This slide provides a simple summary of the path of nutrients. The choices we make on land have a direct impact on water quality. When water runs off our property, nitrogen and phosphorus are carried away by the water. Algal growth is fueled by the addition of nitrogen and phosphorus. The waterway's health declines and the waterway becomes "impaired." So what can we do to stop this process from continuing?



ADVANCED SLIDE: For audiences that request greater detail.

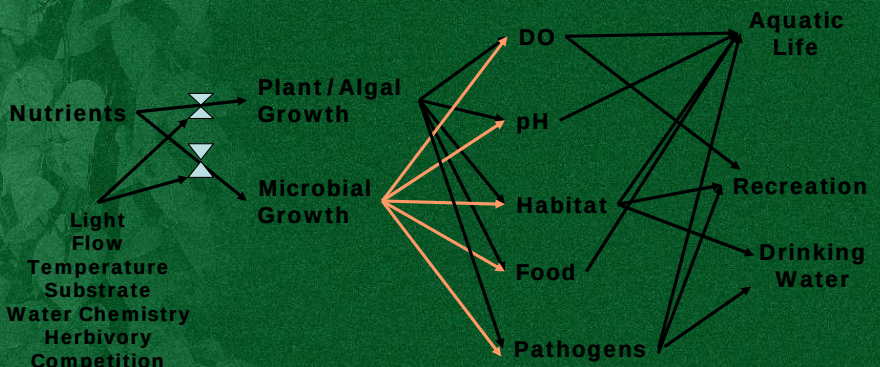
The goal of the Clean Water Act is to restore and maintain the chemical, physical and biological integrity of the nation's waters. In order to help achieve this goal, EPA works with all 50 states and US territories to set and enforce water quality standards for each waterbody. Water quality standards designate the uses for each waterbody (i.e., the human or ecological activities that take place in the waterbody) and assign water quality criteria - the levels of nutrients, chemicals, temperature, sediment and other pollutants that support those uses.

Congress recognized that the public has a vested interest in the quality of our Nation's surface waters. Therefore, the Clean Water Act requires States and authorized Tribes to hold public hearings on their water quality standards at least once every three years. Citizens may make recommendations to public officials for improvements or modifications in the standards during the public hearing process.



Ecological Complexities Create Significant Challenges for Developing WQ Criteria

- Linkages among interacting variables:



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What is EPA Currently Doing?

- Providing States/Tribes and Territories with statistical and expert scientific assistance to identify the complex relationships between nutrients and biological responses depicted in the last slide.
  - Understanding these relationships are critical for developing Water Quality Criteria and Standards.
  - Most States currently working on criteria for rivers/streams and lakes/ reservoirs.
- Building a scientific basis for development of nutrient crtiteria for estuaries and wetlands.
- Developing outreach materials, such as this webcast, to raise public awareness.
- Developing a Progress Report – to be published in May.

EPA

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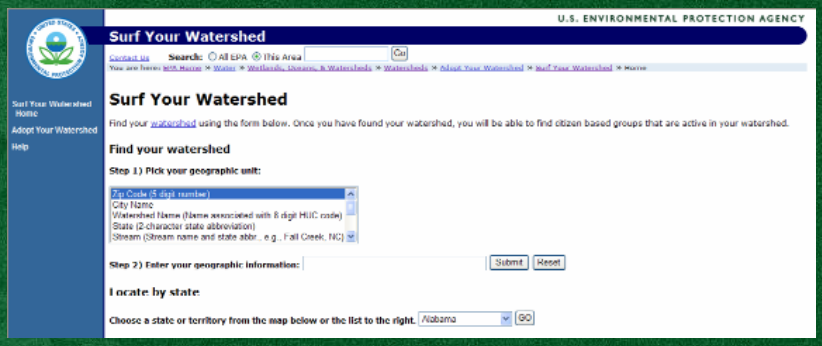
Get Involved in Your State's Water Quality Standards!

- Visit EPA's Surf Your Watershed Website http://cfpub.epa.gov/surf/locate/index.cfm

  Once you locate your watershed, click on *Citizen-based Groups in Your Watershed* to learn about local ways that you can get involved in water monitoring and other watershed-related activities.



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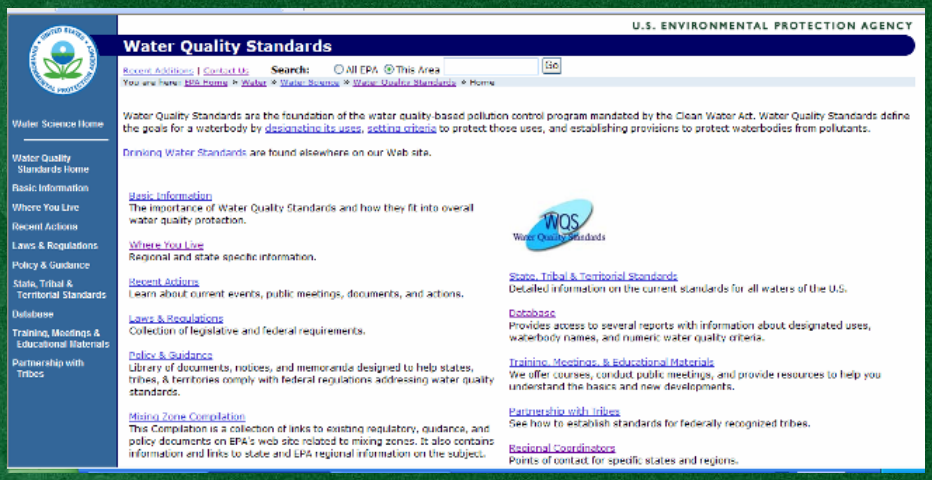
There are so many different ways that you can become involved with water quality in your community!

- Participate in clean-up activities in your neighborhood.
- Write or call your elected representatives to inform them about your concerns and encourage legislation to protect water resources.
- Get involved in local planning and zoning decisions and encourage your local officials to develop erosion and sediment control ordinances.
- Promote environmental education. Help educate people in your community about ways in which they can help protect water quality. Get your community groups involved.

Get Involved in Your State's Water Quality Standards

- Participate in the public review process of your state's water quality standards

  http://www.epa.gov/waterscience/standards



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Visit this site to learn about your state's water quality standards and when the next opportunity will be to participate in the public review process. Be sure to visit the following sections of this page:

- Basic Information – Provides background information on water quality standards and their purpose in water quality protection
- Where You Live – Provides links to EPA Regional pages pertaining to water quality standards
- State, Tribal and Territorial Standards – Provides links to water quality standard documents for each of the states, tribes and territories

Questions?

Steve Potts, Acting Nitrogen and Phosphorus Pollution Criteria Team Leader,

U.S. EPA's Office of Water

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- **Resource Efficient Landscapes**

Presentation Outline

- Water challenges in Florida
- Florida Yards & Neighborhoods
- Educational resources
- Case Studies

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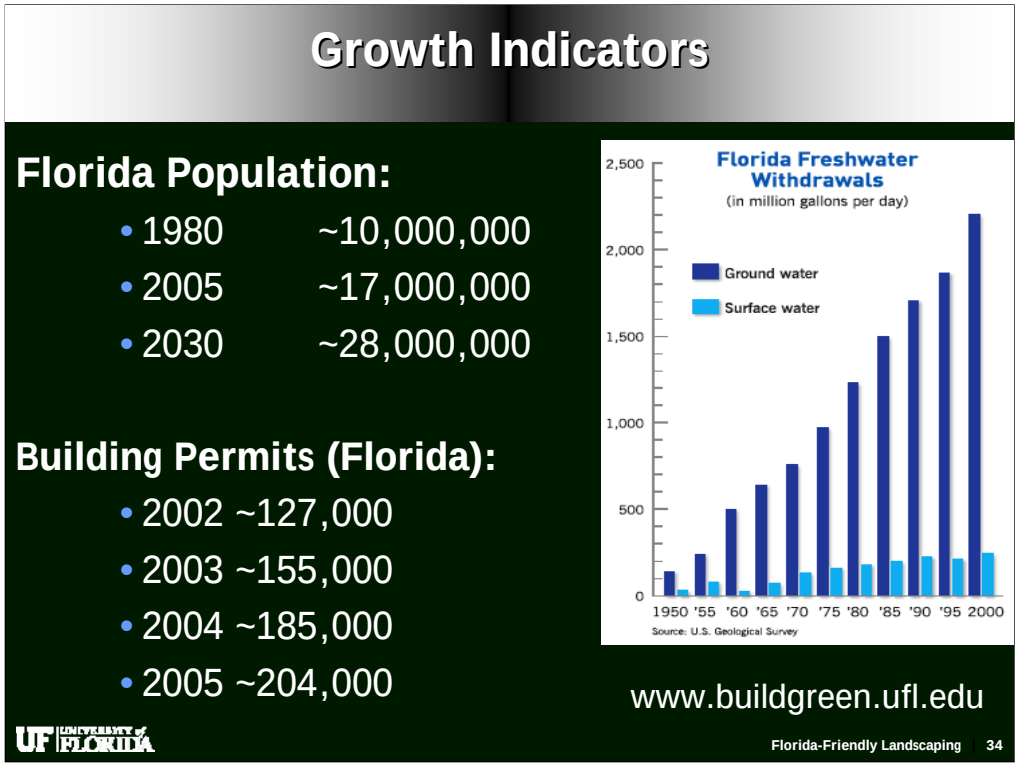
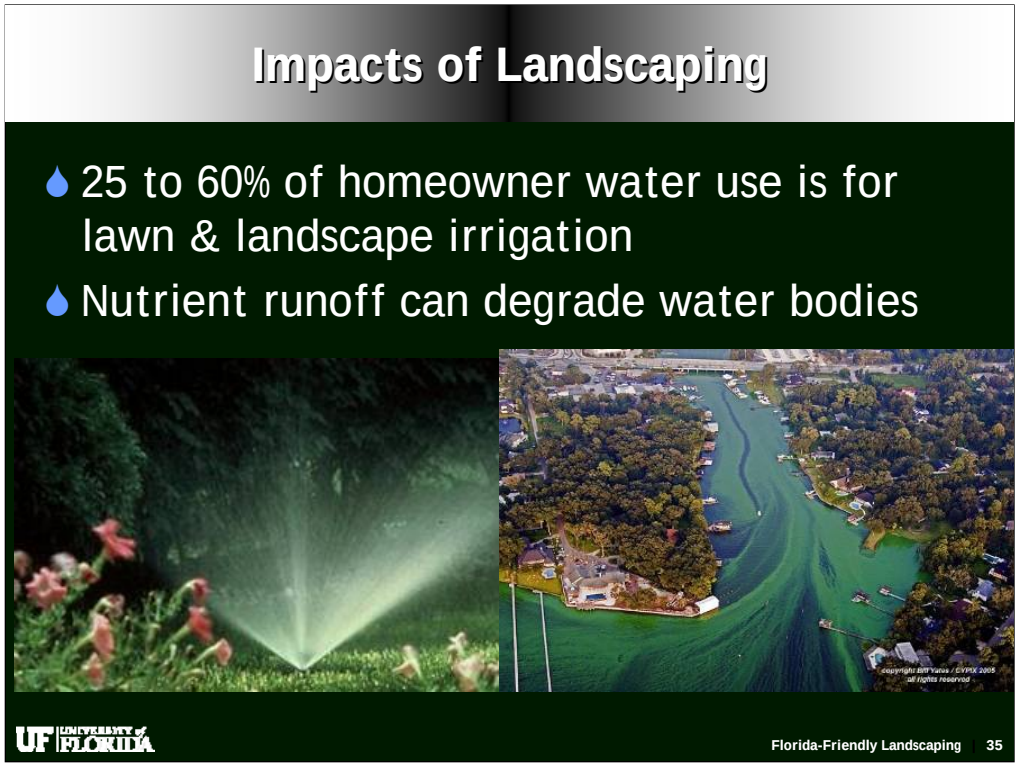
Florida-Friendly Landscaping | 33



Thisisthe context in which we are all working. In 1980 Florida's population was 10,000,000. In 25 years it has grown to 17,000,000. Current estimates project that Florida will have 11,000,000 more residents by 2030.



As we know, landscaping irrigation is a big water quantity issue. Tampa Bay Water noted 25 to 30% of water used is for irrigation and South Florida estimates half of water used is for landscape irrigation. A recent irrigation study at the University of Florida showed homes using more than 60% of their water supply for irrigation (not on slide).

If lawns were a crop, they would be ranked as the 5th largest one after corn, soybeans, wheat, and hay. They use fertilizer inputs similar to row crops. (www.stormwatercenter.net)

Florida Yards & Neighborhoods (FYN)

- FYN, a University of Florida Extension program, partners with national, state and local agencies to teach Florida friendly landscaping.

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Florida-Friendly Landscaping | 36

Florida-Friendly Landscaping Goals

- Reduce Water Consumption
- Protect Water Quality
- Design for Both Humans and Wildlife

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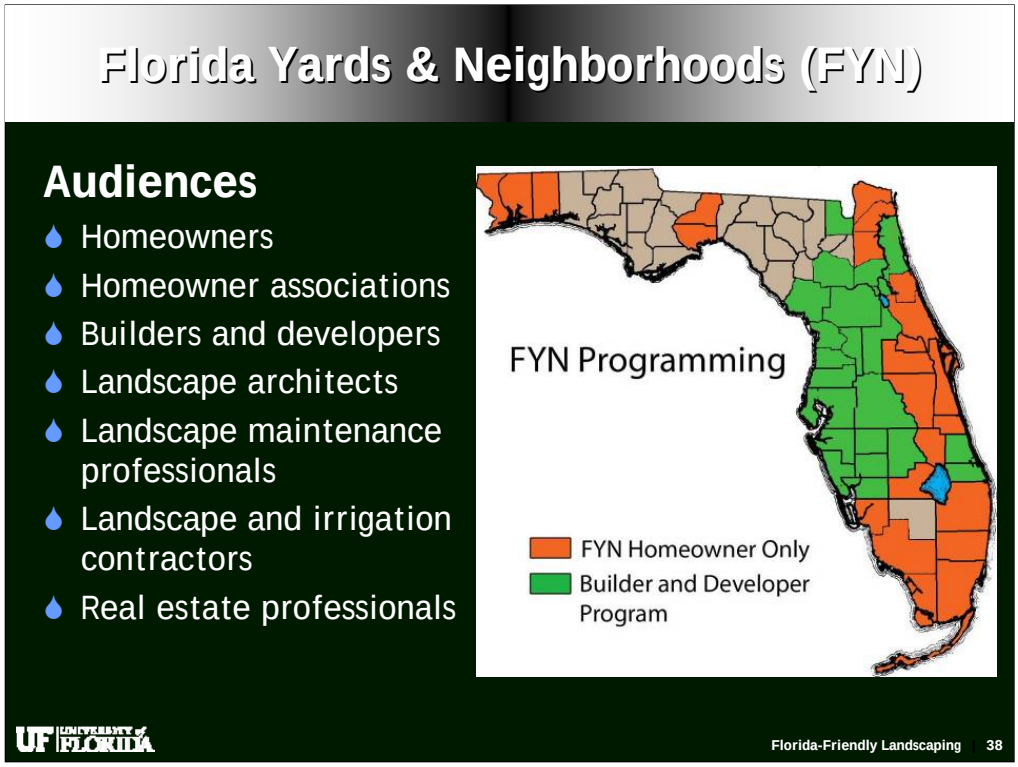
Florida-Friendly Landscaping | 37



- In the last five years, FYN's target audience has expanded to include builders, developers, landscape architects, landscape maintenance professionals and real estate professionals.

- We currently have coordinators working (either full or part-time) with Builders and Developers in 22 counties.

- The state office provides support for those counties that currently do not have a staff person formally in the Builder/Developer Coordinator role.

FYN's mission is to create beautiful landscapes that also protect our natural environment by conserving water and adapting landscape designs to the local conditions.

- FL Statute 373.185 (1)(b) "Florida-friendly landscape" means quality landscapes that
  - Conserve water
  - Protect the environment
  - Are adaptable to location conditions
  - Are drought tolerant

- **Florida Yards & Neighborhoods** can help you transform your yard into a beautiful oasis that will not only conserve precious water resources and reduce pollution, but will also help you save time, energy and money.

Florida-friendly landscaping emphasizes nine major principles:

- FYN is based on nine core principles:
    1. Right plant, right place
    2. Water efficiently
    3. Fertilize appropriately
    4. Mulch
    5. Attract wildlife
    6. Manage yard pests responsibly
    7. Reduce stormwater runoff
    8. Recycle
    9. Protect the waterfront

- These principles include issues such as watering efficiently and reducing stormwater runoff which go beyond simply the type of plants to use. Combined, these principles help us to reduce water consumption and reduce nutrient inputs into our water bodies.

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Low Impact Development

- Swales

Low Impact Development

Credit: Dr. Mark Clark, UF

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When water infiltrates through porous limestone and sandy soils, it can carry fertilizers with it into the groundwater.

Good prevention mechanisms include the proper application of slow-release fertilizers.

Overfertilizing can aggravate pest problems, stimulate excessive growth and require frequent watering. If fertilizing, the best choice is a slow-release fertilizer.

Nitrogen promotes shoot growth, so if you use a slow-release nitrogen, you'll have less growth surge. In lawns, that means less thatch accumulation following fertilizer application which ultimately means less mowing.

Apply fertilizer when grass is actively growing, not when it is dormant. Use a drop spreader rather than a rotary spreader. Do not fertilize if rain is forecast.

Thatch definition – a layer of dead and living plant matter that accumulates between soil and turf, often blocking water and nutrient movement into soil.

Fertilizer bags: three numbers indicate percentage of N-P-K. Get no more than 2% P if you have ample P in soil. Look for either ½ as much K as N or equal amounts depending on soil test.

Resources for Homeowners

- www.FloridaYards.org

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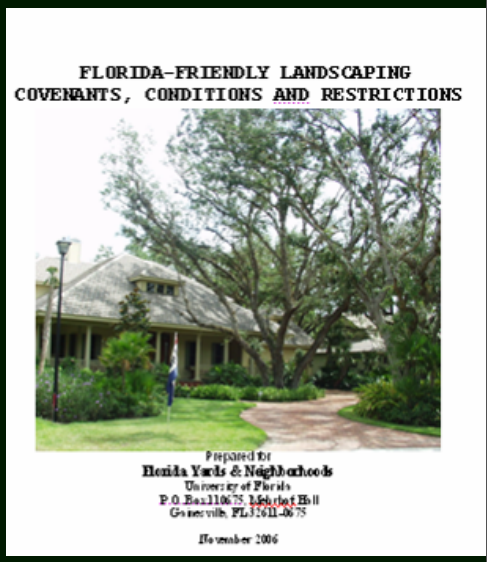
- There are a number of training programs that exist or are being created/revised:
  - Green Industries BMP training: http://turf.ufl.edu/
  - Florida Nursery, Growers and Landscape Association: http://www.fngla.org/
  - Florida Landscape Management Association: http://www.floridalma.org/

- The developer decided to make this a Florida-friendly community because of his own personal commitment and the additional marketing benefit that comes from being a Florida-friendly community.

- As you can see here, the dedication to creating a Florida-friendly community extends to maintaining this landscape in perpetuity through the community rules and regulations.

Resources for Developers & Engineers

- Low Impact Development CEU training (provided by UF's Program for Resource Efficient Communities)
- Model Covenants, Conditions and Restrictions (CCRs)



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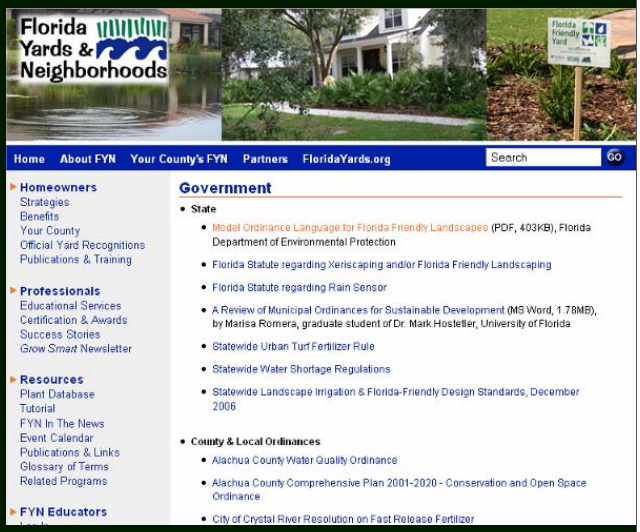
Resources for Governments

- Model Florida-Friendly Ordinance
  (developed by FL DEP)
- Links to city and county ordinances throughout state



http://fyn.ifas.ufl.edu/government.htm

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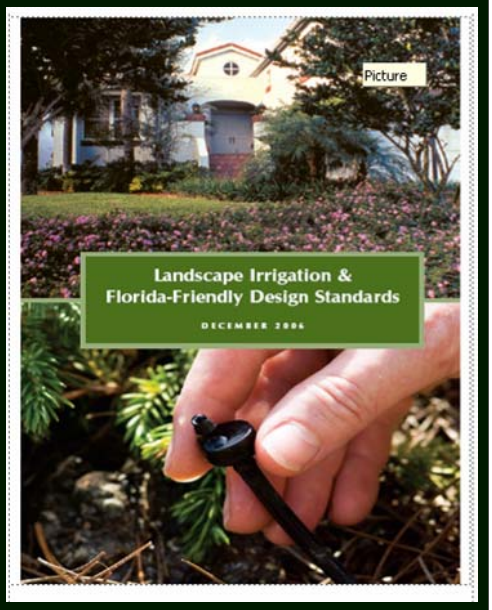
Resources for Governments

- Low Impact Development training (provided by UF's Program for Resource Efficient Communities)
- Florida Irrigation & Florida-Friendly Design Standards (developed by statewide Committee on Landscape Irrigation and Florida-Friendly Design Standards)



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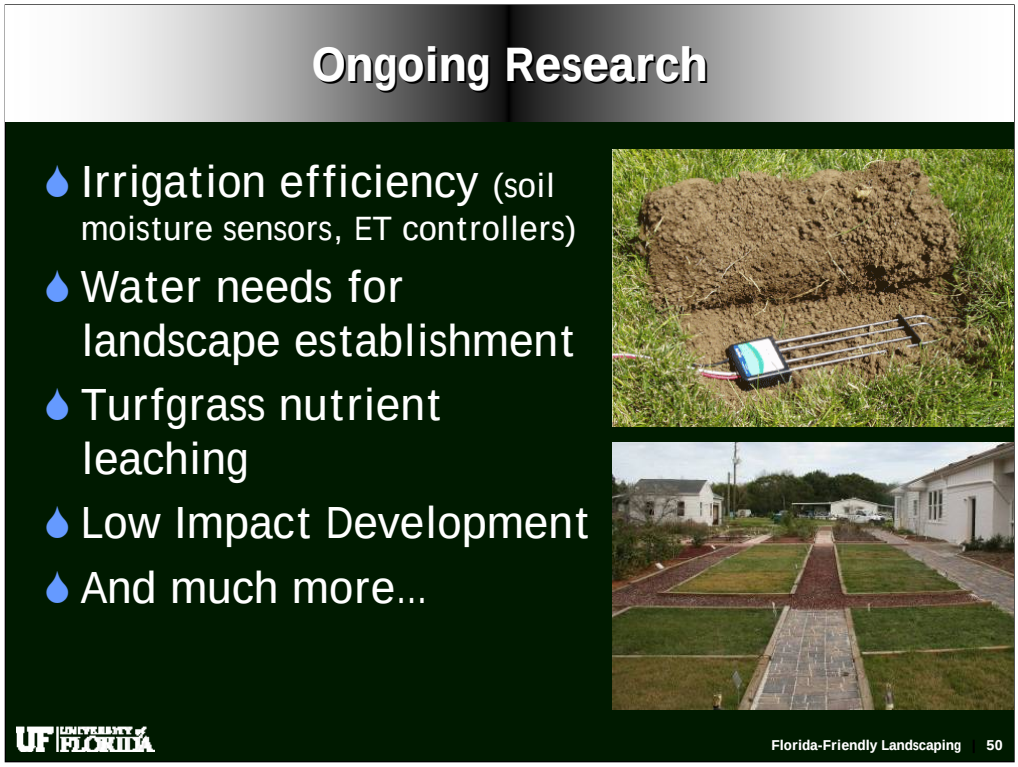

Soil moisture sensors can save 80-90% under optimum conditions

Case Study: Madera Community

Location:	Gainesville, FL
Size:	44 acres
Homes:	88 single-family
Developer:	GreenTrust, LLC Partnership with UF/PREC

Narrow Uncurbed Roads

Careful & Limited Clearing

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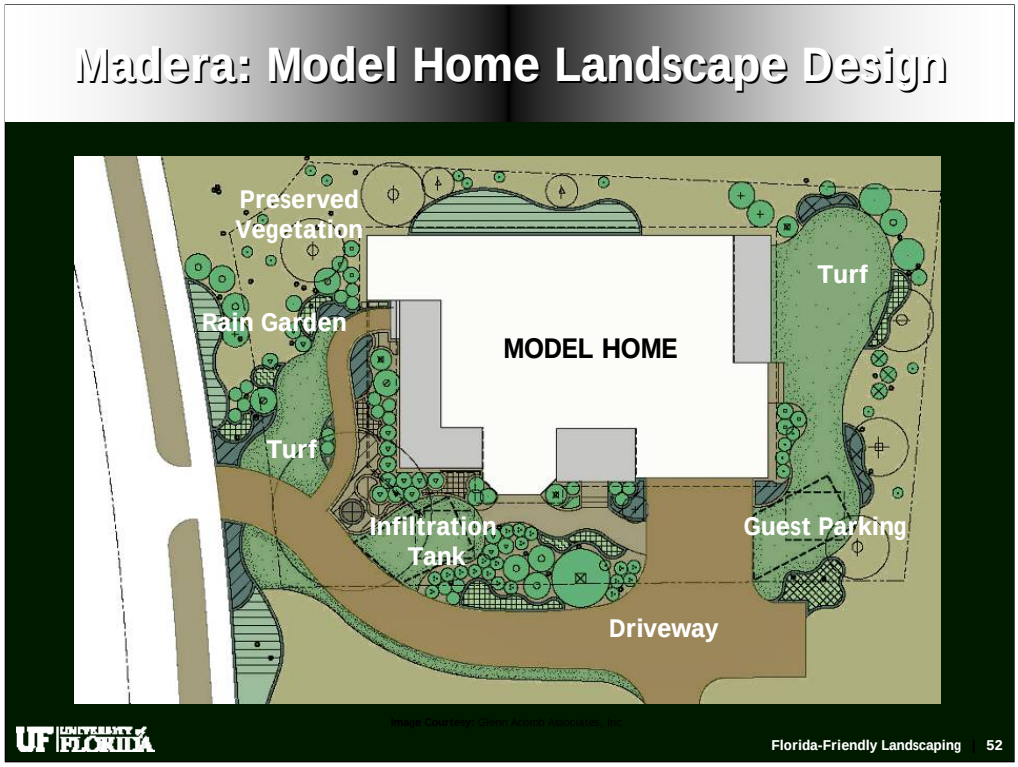

At the lot level the development attempts to achieve "zero discharge" by using a combination of techniques.

pervious pavement, the Atlantis system to catch and reinfiltrate rooftop runoff and a bioretention area/rain garden.

The Madera model center has one third the amount of traditional lawns, which results in less mowing and emissions from mowers, less fertilizer, pesticide and herbicide applications, and more water conservation.

- Limited clearing of site
- Limited turf (35% of conventional)
- Limited irrigation (50%); low volume design
- Limited impervious cover - Pervious pavers for driveway & sidewalk; shared driveway for some lots
- Zero discharge of stormwater – Capture of 1/3 roof stormwater to an infiltration tank in front yard; water garden in front yard; natural areas reduce and cleanse runoff
- Use of natives and "Florida Friendly" plants; Florida Yards & Neighborhood principles
- Wildlife friendly design (extensive buffers; use of snags)
- Model home displays green products to promote to public & builders

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- Limited irrigation / low volume design
  - 50% of conventional
- Limited impervious cover (encouraged)
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- Use of natives and Florida-friendly plants
  - SJRWMD & Florida Yards & Neighborhoods support
- Retained snags in rear yard buffer
- Model home displays an array of green products

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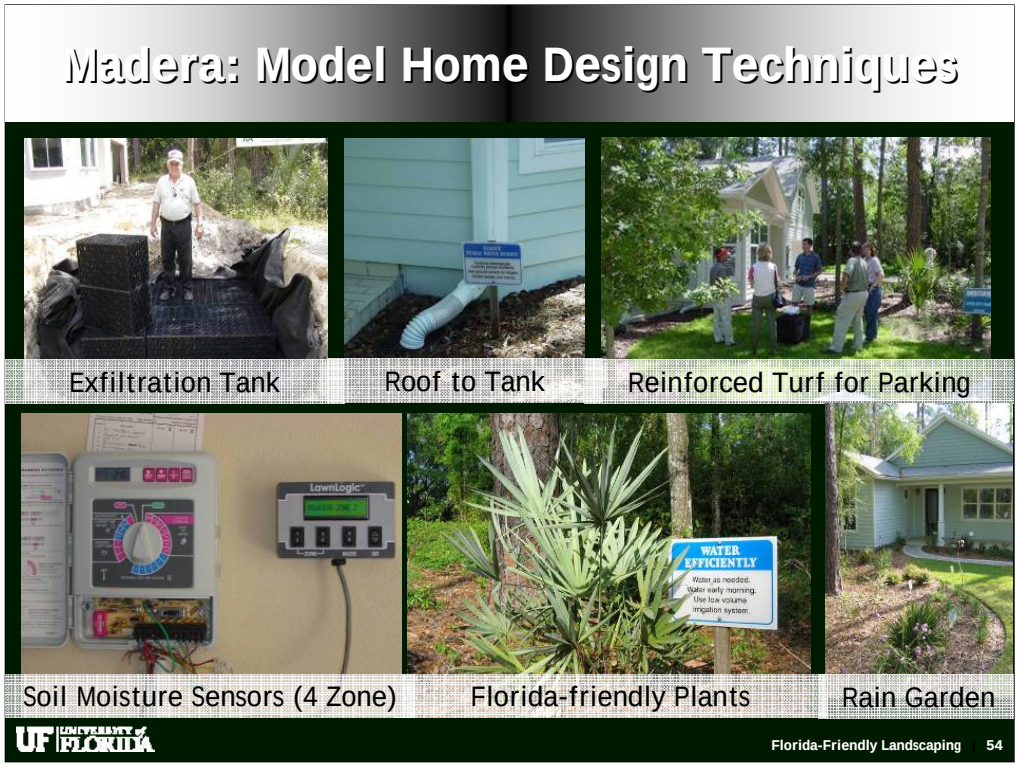

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Case Study: Hancock Place

- Affordable SF homes
- Florida-friendly landscaping
- Florida-friendly CCRs
- Education for new homeowners
- Only micro-irrigation
- Energy Star & Florida Water Star[SM]

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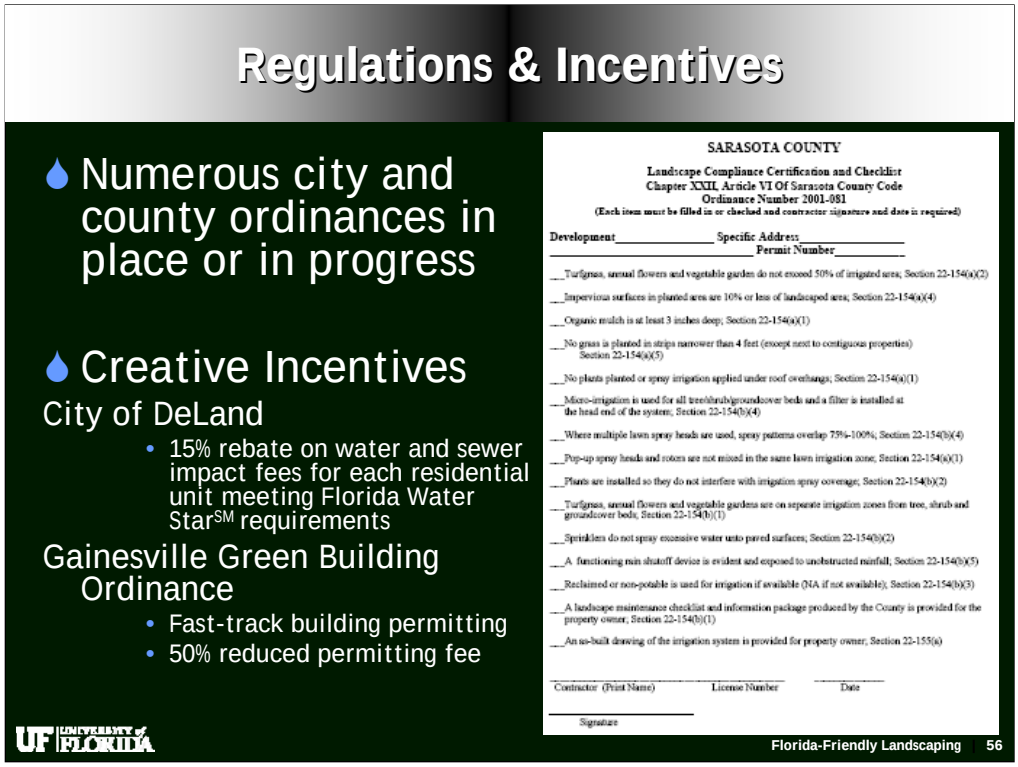
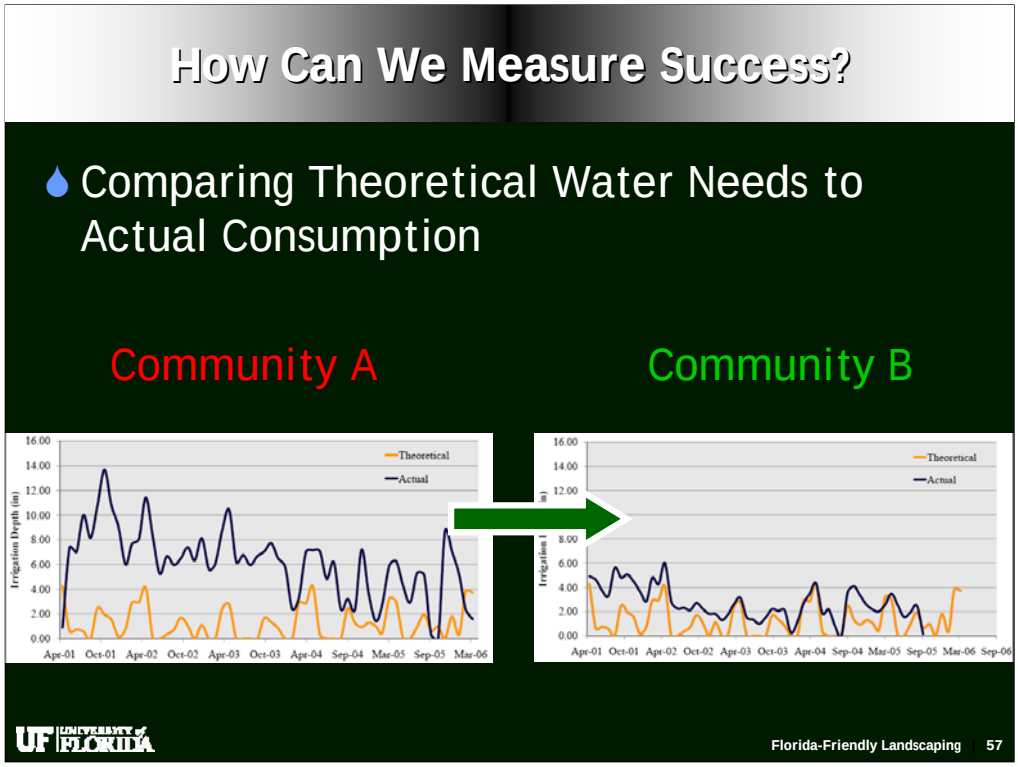


- There are an increasing number of counties and cities that are implementing ordinances which delineate landscaping and/or irrigation requirements. Some ordinances specifically reference the Florida Yards & Neighborhoods educational program.

- By standardizing your landscapes to be Florida-friendly, you can stay ahead of the curve with new ordinances that are coming.

- For instance, in Sarasota, the local ordinance requires microirrigation in landscape beds. Contractors trained in microirrigation are now installing these systems in surrounding counties as well and are staying ahead of the curve of local ordinances.

- The graphic is of the checklist that accompanies the Sarasota County Ordinance. The checklist is completed by the contractor and then reviewed by an inspector for compliance.



Different types of communities – ex. maintenance free to residential maintenance to landscape maintenace contractors

Challenges

- Measurable Results
- Research Gaps
- Homeowner education
- Covenants in place prior to 2001
- Developer buy-in
- No incentives for LID

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Contributors – Thank You

- Glenn Acomb, ASLA
  - Associate Professor, Department of Landscape Architecture
- Michael D. Dukes, Ph.D., P.E., Barnardo Cardenas-Lailhacar, Melissa B. Haley
  - Agricultural & Biological Engineering
  - Institute of Food and Agricultural Sciences (IFAS)
- Pierce Jones, Ph.D.
  - Director, Program for Resource Efficient Communities

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Questions?

Ondine Wells, Statewide Builder and Developer Coordinator, Florida Yards and Neighborhoods

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Next Month's Webcast

Monitoring Watershed Program Effectiveness

April 10, 2008, 2:00-4:00PM EST

See epa.gov/watershedwebcasts for more details

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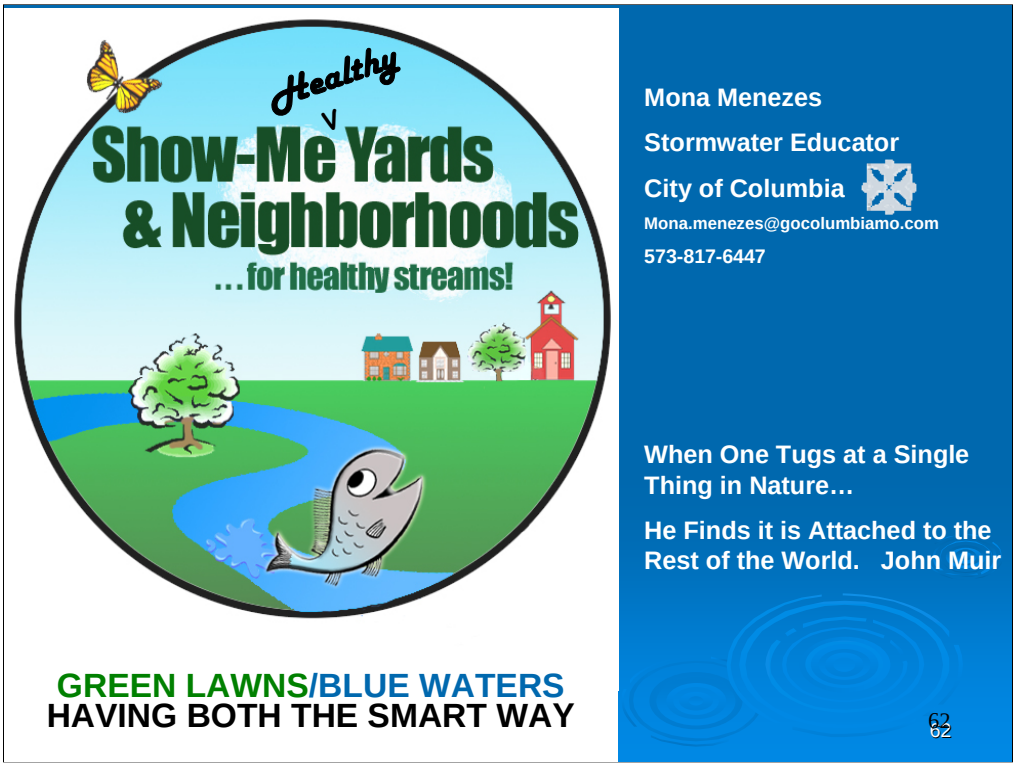

Welcome to SMYN. I think you may be seeing more of this in the future. Although smyn started in Springfield, Missouri, the concept is actually a nationwide endeavor. This concept began at least a decade ago in an effort to clean up the Everglades and restore them to their original function of water filtering, buffering and storage. It was later adopted by both North and South Carolina, then spread to Springfield and many other cities around the nation in response to the Clean Water Act provisions for cleaning up urban stormwater.

Why Address Lawn Care?

- "The City is not in the Lawn Care Business"
- Stormwater Education
- Perfect Link between Home (Personal Interest)/Stormdrain/Stream
- Impaired streams

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Building A Program

- Missouri does not yet have a statewide lawn care program like Florida Yards & Neighborhoods
- Is a natural fit for state Extension
- Springfield, Missouri initiated ShowMe Yards
- We started from scratch

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Who Would Invest?

- One person has to assume leadership or “heavy lifting”
- City stormwater engineer
- State 319 Nonpoint Source Funds
- Local lawn care companies/Professional Organizations
- Extension
- Non-profit Watershed Groups
- Parks Department Staff
- Americorps
- Other

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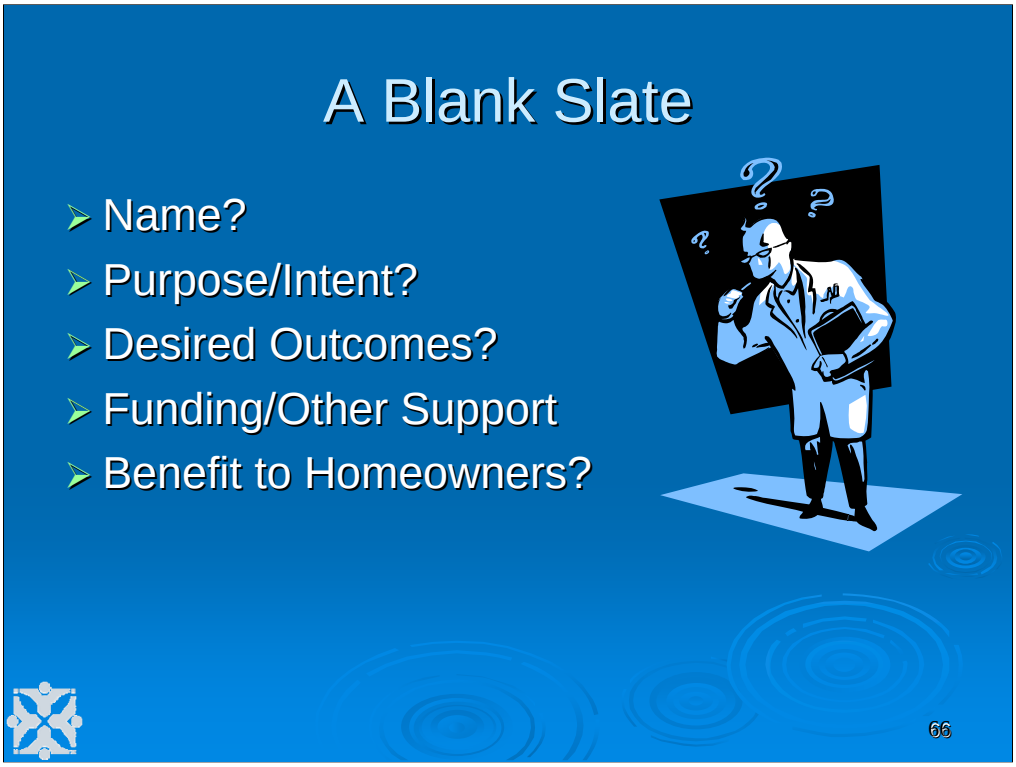

We decided for a unified concept with Springfield, located nearly 200 miles from us but just in case the idea went statewide in the future. A nearby city (30 miles away) followed our example but changed the name and charged fees to attend.

Purposes of SMYN

- Educational effort to reduce chemical runoff to streams.
- Help Missouri cities meet their stormwater permit requirements under Clean Water Act provisions.
- Provide public outreach & participation in nonpoint pollution reduction.
- Promote responsible yard care with healthy…not perfect….lawns.

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What Show-Me Yards is NOT:

- An effort to promote only organic gardening or lawn care.
- Required under any laws
- An opponent of commercial lawn care

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Funding

- Initial workshop cost about $200.00
- City expended about $2000 in 2007
- Nearby city did cost recovery ($45 for three session workshops)
- Room rental, copying, coffee, advertising, brochures, signs

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Best Features

- Brochure
- Self-Assessment Scorecard (Rate Yr Yard)
- Videos
- City Channel
- Workshops
- Field Days
- SMYN Yard Signs
- Website

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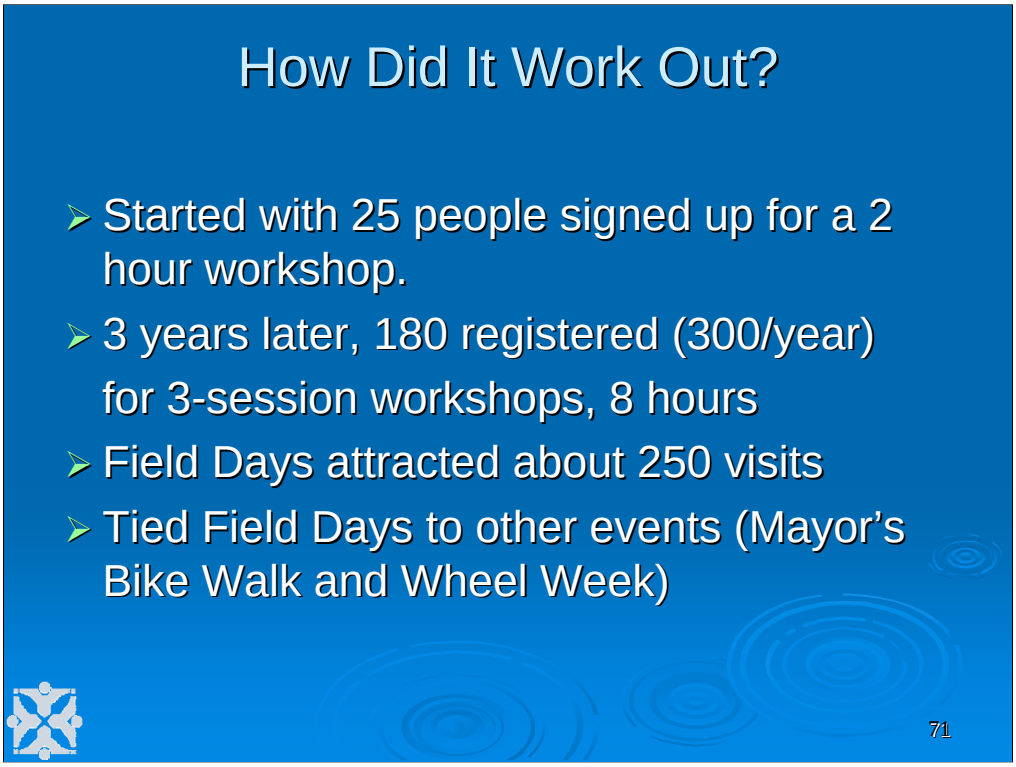
Brochure is important first point of contact. Includes self-assessment scorecard.



Our Saturday morning classroom had been hijacked so we were literally crammed into a small room that only I couldn't fit into. It lasted 3 hours instead of 2. People seemed to like it.

A Show-Me Yards Workshop

Green Lawns / Blue Waters: Have Both… the Smart Way!

Want to save time and money on yard care that's environmentally friendly?
Want to have a great lawn plus get answers to your yard-care problems?
Did you know homeowners use 10 times more chemicals per acre on lawns than farmers use on crops?
90% of U.S. streams sampled contained pesticide residue. Did any of that come from your yard?

This 3-session Workshop will include:

- Moles, Fungus & Crabgrass: Solving Basic Problems
- Adding Nutrients & Minerals Without adding Chemicals
- Why Consider Native Plants?
- Healthy Soil = Healthy Grass & Gardens
- How & Why to Build a Rain Garden
- Resisting the Urge to Spray: The Good, The Bad & The Ugly Bugs
- Equipment & Techniques for Your Best Lawn Yet

This is a 3-week session: Wednesdays at the ARC
February 6th, 13th & 20th, 6:30-9 p.m.

Questions or to Register: 874-7616
or Email mona.menezes@GoColumbiaMo.com
Free & Open to the Public Registration Required

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Rate Your Yard

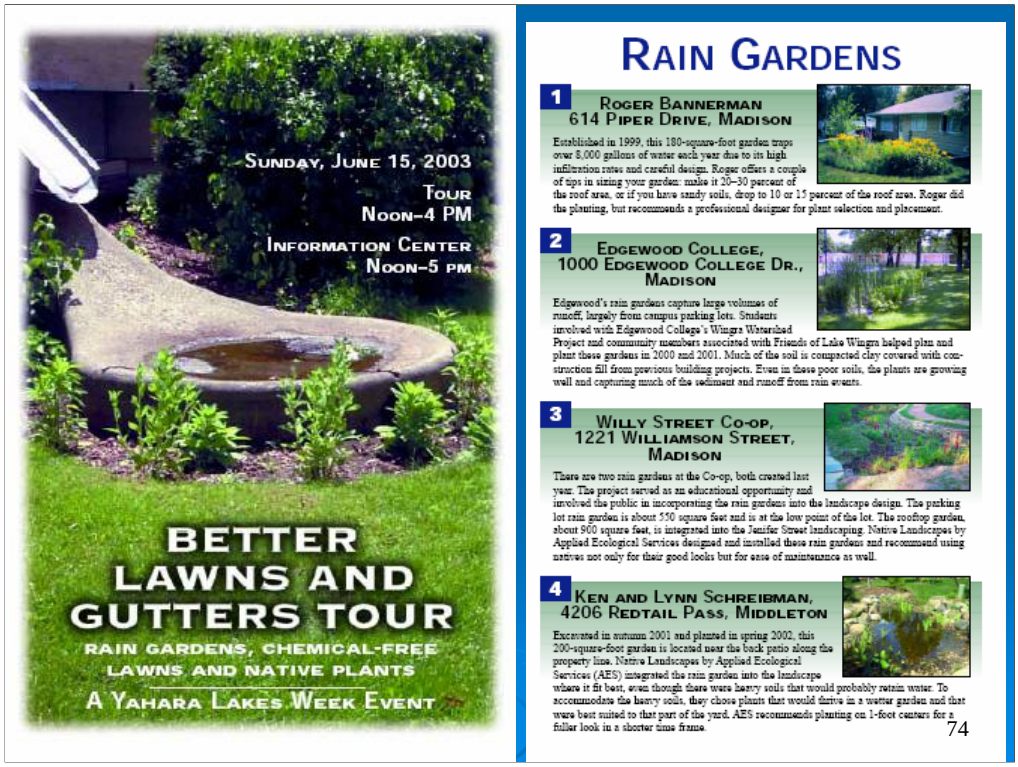
Scorecard

Show-Me Yard Scorecard

See how you measure up! Circle all the practices you have implemented in your yard, and add them up at the bottom of the page. Place a 37-cent stamp on the back of this card, and drop in the mail to receive a free SMYN rain gauge. Top scoring yards will receive a yard sign (starting Spring '06).

Mow high- 3 to 4 inches or highest setting	5"
Sharpen mower blade at least once per summer	2"
Never mow more than 1/3 of the height of your lawn	2"
"Don't Bag It"- Leave clippings on lawn. Mow over leaves in the fall.	3"
Overseed bare spots in early spring or early fall	2"
Measure your yard (one adult pace = approximately 3 feet)	5"
Use organic herbicide/pre-emergent (such as corn gluten or 20% vinegar)	5"
Use a rain gauge to track rainfall and avoid unnecessary watering	1"
Install a rain barrel	5"
Install a rain garden	8"
Percent of yard in tree cover with no bare soil underneath (2" per 10% of yard, 10" max)	2"
Identify pests before taking action	3"
Reduce use of lawn chemicals by changing cultural practices, and apply according to directions	5"
Have a soil test done. Apply nutrients per recommendations.	8"
Check streets & sidewalks after applying lawn products; sweep excess into lawn, not the street.	3"
Properly dispose of old lawn care products at household hazardous waste collection site	4"
Clean up pet waste on lawns	2"
Compost or mulch yard waste, grass clippings and/or leaf litter at home	3"
Include native plants (1" per 10% of yard, rounding up)	1"
Mulch circles beneath trees and around beds	3"
Replace synthetic landscape fabric with natural fiber such as newspaper.	2"
Required: Attend a Show-Me Yards workshop OR go to www.clemson.edu/cyn/nine.html for online tutorial.	6"
Total	

73



May 19, 2007 ***Green Lawns/Blue Waters: A Show-Me Yards Field Day*** **10:00 – 2:00 p.m.**

See Map on Back **Experts On-Site**

A **Wet Rain Garden**
302 Edgewood Avenue
(Home of David Webber)

This rain garden is designed to retain some water during the year and will detain, cleanse, and slowly release stormwater runoff. Some native plants that can be used in raingardens are Copper Iris, Blue Flag Iris, Spikerushes, Equisetum, Swamp Milkweed, Rose Mallow, Blue Lobelia, and Cardinal Flower.

B **Organic Lawn/Dry Rain Garden And Native Plants**
408 South Garth Avenue (Home of Jeff Zimmerschied)

This lawn has been maintained organically for more than a decade. Its lush, vigorous grass is the result of using proper mowing and cultural practices (see SMYN brochure), soil testing, and the use of natural products like corn gluten, microbes, cedar oil, minerals and garlic spray. The "dry rain garden" in the back yard is designed to minimize and filter stormwater runoff from two roofs. The flower beds & rain garden are filled with native plant species that thrive in Missouri soils and climate conditions without requiring additional chemical inputs.

C **Stephens Lake Park Rain Garden**
(West Edge of Park, Next To Parking Lot Off Old Highway 63)

This "wet" rain garden was designed by the city Parks & Recreation Department to capture stormwater runoff from the adjacent parking lot. Typically, vehicular pollutants washed off the lot from the "first flush" enter nearby streams. The leaves, roots & stems of the selected aquatic plants can absorb, store, or breakdown potential pollutants like heavy metals, nutrients, oils and greases. The bald cypress trees planted around the basin can use up to 1000 gallons of water each day.

D **Dry Rain Garden**
612 Laurel Drive
(Home of the Zwonitzers)

There are two kinds of rain gardens – wet & dry. The water stored in a dry rain garden is absorbed into the soil within 24 hours. With either type, when you make a garden a "rain garden" you will improve water quality while creating a beautiful area that will attract birds and butterflies.

For more information: Contact Mona Menezes, Columbia Public Works 817-6447

E **Organic Lawn & Garden**
Shelter Gardens 1817 W. Broadway
(Tours by Jeff Zimmerschied & Master Gardeners)

Shelter Gardens began using organic methods and practices in the fall of 2004. This process started with a number of soil tests of the lawn and flower beds. By improving the soil with soil amendments, organic fertilizers and foliar spraying, the plants are healthier, better able to tolerate stresses, have more blooms and the roses are even more fragrant. During the tour you will probably see a lot of earthworm castings. Earthworms are a sign you are heading in the right direction with your soil management.

F **Rain Barrel & ShowMe Yard**
1201 Sunset Lane
(Home of Trevor Harris)

Collecting rainwater in a rain barrel is an ancient practice that still proves to be very practical. Observe how a rain barrel can collect and store rainwater from a rooftop to use later for lawn and garden watering. These inexpensive and easy to build storage barrels provide water that would otherwise flow through your downspout, onto a paved surface, and eventually into a storm drain. Information on how to make and install your own rain barrel.

G **Native Plant Makeover by Grow Native!**
1516 Windsor Street (Corner of Windsor & Williams)
(Backyard of Jim Ronald and Irene Unger)

Three beds of native shrubs and small trees provide a screening effect from adjoining homes plus a parking lot to create a great habitat for a variety of birds and animals. Shrubs produce early spring blossoms and brilliant fall foliage, among them are Ninebark, American Beautyberry, Serviceberry, and Redbud. A curved bed near a public sidewalk is filled with native plants that attract butterflies, provides summer-long color and forms healthy urban habitat. Among the plants are Purple Coneflower, Purple Poppy Mallow, Royal Catchfly, and Eastern Blazing Star.

H **Native Plant Makeover & Rain Garden**
3016 Meghann Drive – south of Hy Vee
(Home of Scott and Jenny Hanson)

Butterfly Weed serves as a larval host and attracts monarch butterflies to this rain garden. Others plants such as the Stiff-Leaved Aster, provide nectar for the Monarch's fall migration. Hummingbirds are drawn to the garden's many nectar-producing plants such as Columbine and Wild Sweet William. As a result of using these wildlife-friendly plants, there are plenty of birds, butterflies and other critters in the Hanson's yard serving as tools to teach their daughter about wildlife habitats. Once established, the Hansons won't have to worry about watering them either, because native plants are adapted to Missouri's weather conditions.

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Northwest Natural Yard Days (Seattle, Washington)

- An incentive program to encourage homeowners in King County to change the way they care for their yards.
- Northwest Natural Yard Days is now in its eighth year.
- The goal of this popular program is to encourage residents of King County and surrounding areas to purchase environmentally preferable yard care products and to practice natural yard care.
- The retail sales sponsored by Northwest Natural Yard Days partners take place in spring and fall each year. Check this Web site in March for details about the spring sales which will begin in April, 2006.

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Use of Yard Signs

- To date, the section 319 Nonpoint Source funded project has put out signs in 42 yards
- Each for two weeks

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Neighbor to Neighbor Education

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SHOW ME YARDS DEMONSTRATION AREA AT ROCK BRIDGE STATE PARK

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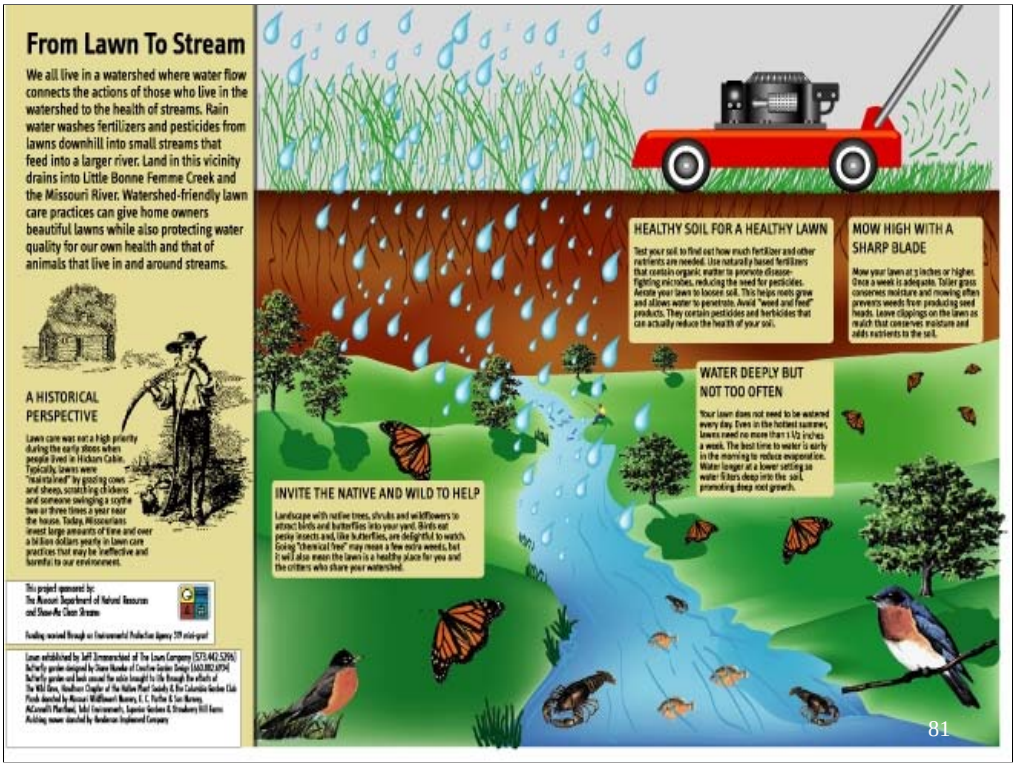

Green Lawns/Blue Waters
Lawn Care Professionals Workshop

- March 4 2008 8a.m. to 3 p.m.
- University of Missouri Extension

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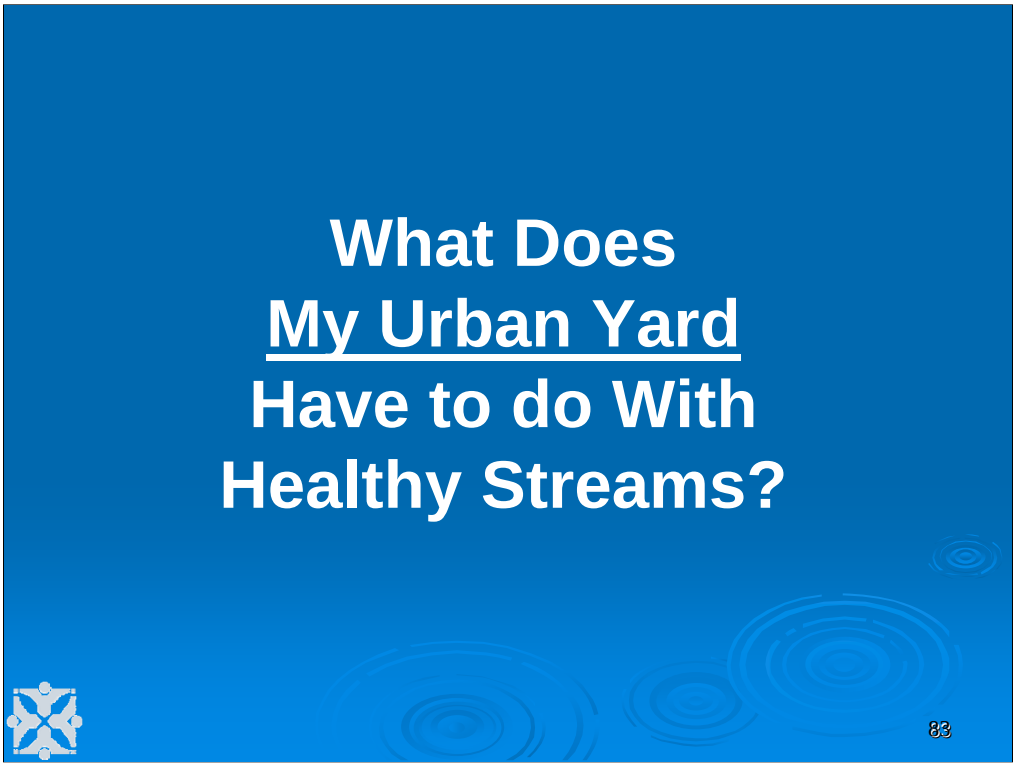
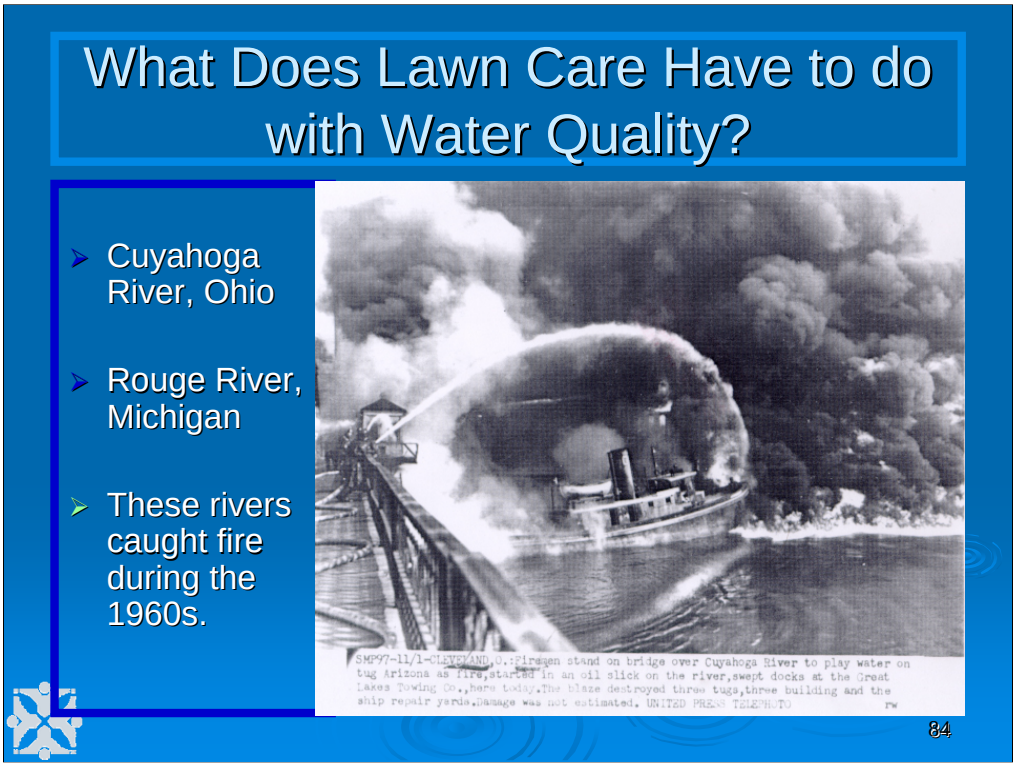
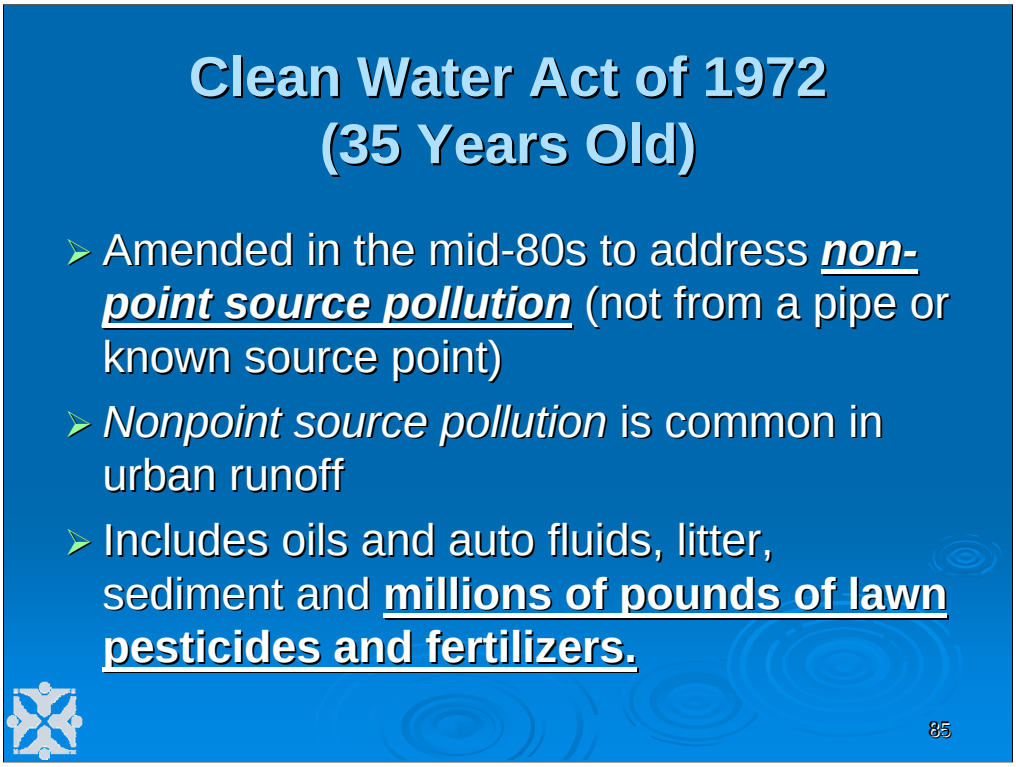


It rains and water runs downhill. In doing so, it takes with it whatever it encounters, including lawn chemicals. It has caused a “dead zone” of over 7000 square miles down in the gulf of Mexico. As a nation, its adding up.

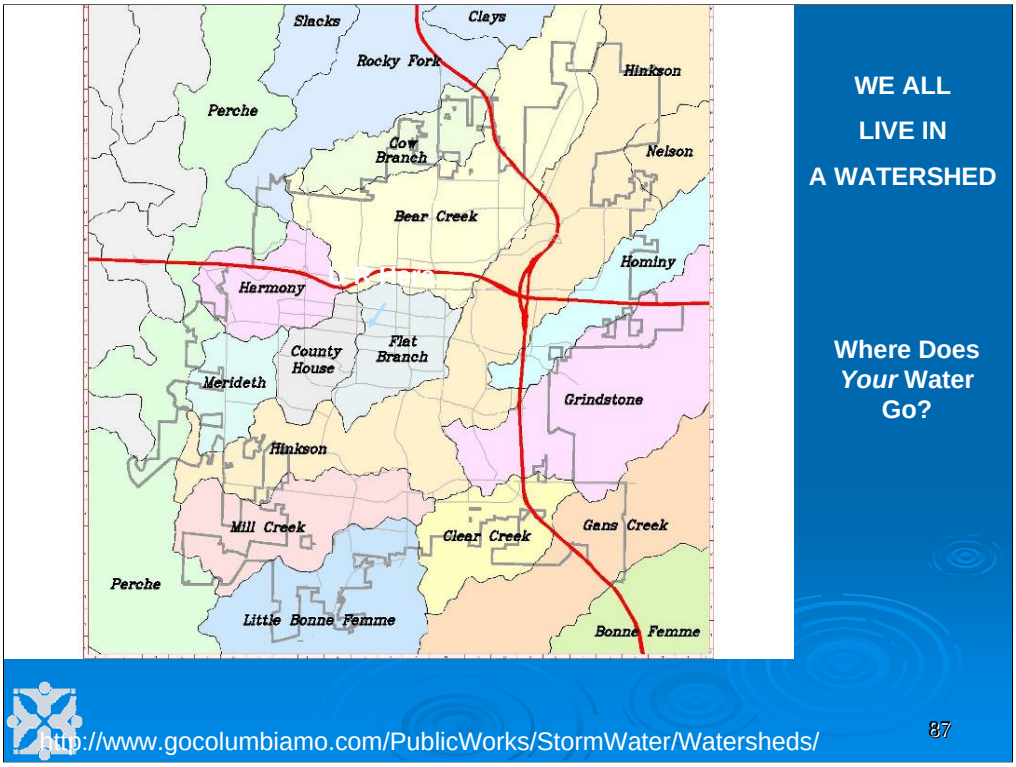


Although the river had in fact caught fire several times during the 50s, it was considered just the cost of having producing industrial goods in America. But in 1969, Time Magazine had this report:

"Some river! Chocolate-brown, oily, bubbling with gases, it oozes rather than flows. 'Anyone who falls into the Cuyahoga does not drown,' Cleveland's citizens joke grimily. 'He decays.' The Federal Water Pollution Control Administration dryly notes: 'The lower Cuyahoga has no visible life, not even low forms such as leeches and sludge worms that usually thrive on wastes.' It is also--literally--a fire hazard. A few weeks ago, the oil-slicked river burst into flames and burned with such intensity that two railroad bridges spanning it were nearly destroyed. 'What a terrible reflection on our city,' said Cleveland Mayor Carl Stokes sadly" It was a very low point for our nation's water system. It also became a rallying cry for clean rivers and streams.



Actually a result of 2 rivers catching fire. The Cuyahoga in Ohio and Rouge in Michigan.

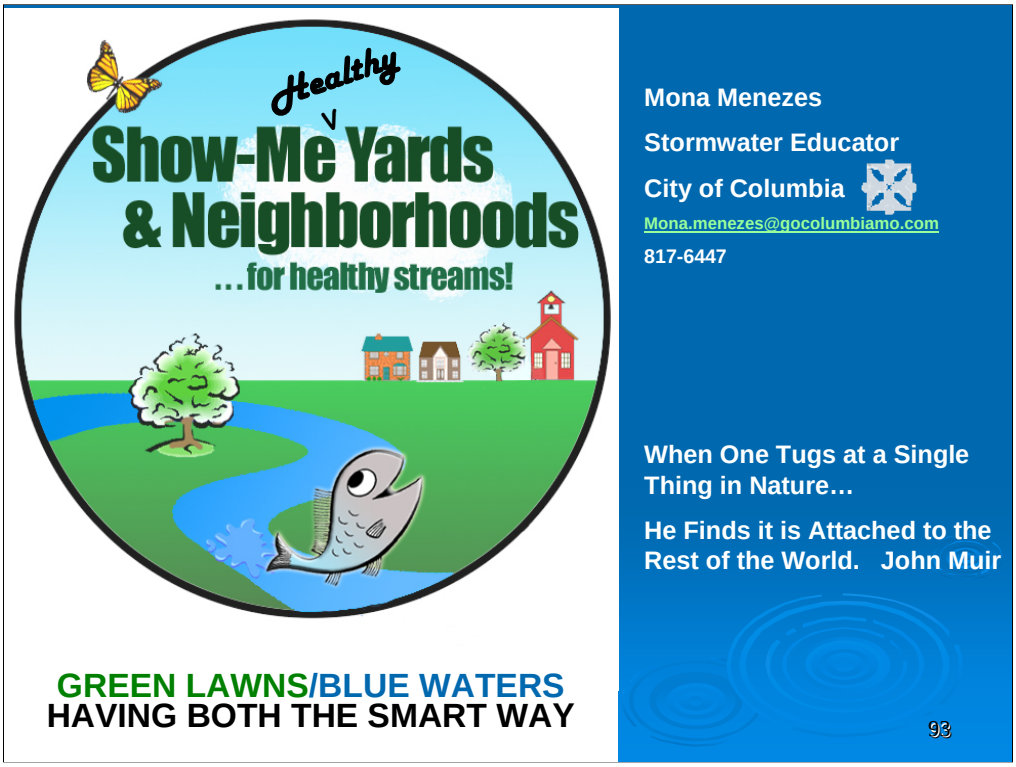


If those are examples of where those storm drains led…where does the water from your lawn end up? Your first assignment will be to locate your home on the watershed map nearby, during the break.

Where do you suppose this is? Somewhere in the mountains? Out on the coast? Down in the Ozarks? Look closer. See the UMC smoke stack in the background? That's the umc power plant. This stream is less than three blocks from here and from the center of Columbia's downtown. It's streams like this that are being addressed by smyn and similar programs around the country. This was originally an EPA cleanup site. Creek has been restored and its sinuosity or curves are being restored. The park now gets thousands of visitors to what used to be an abandoned railway site.

This photo taken across from the D&H on Broadway. It could be any downtown storm drain. I think the little pellets are probably lawn chemicals.

Not far at all from the inlet to the stream.



Questions?

Mona Menezes, Stormwater Educator, City of Columbia, MO

Steve Potts, Acting Nitrogen and Phosphorus Pollution Criteria Team Leader, U.S. EPA

Ondine Wells, Statewide Builder and Developer Coordinator, Florida Yards and Neighborhoods

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Check out Additional Resources at:

http://www.clu-in.org/conf/tio/owmnybyc/resource.cfm

Please give us feedback on the Webcast at:

http://www.clu-in.org/conf/tio/owmnybyc/feedback.cfm

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